1990 Annual Report
General Mills

East Hennepin Avenue Site
Minneapolis, Minnesota

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General Mills, Inc.

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1990 ANNUAL REPORT
GENERAL MILLS, EAST HENNEPIN AVENUE SITE

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1990 ANNUAL REPORT
GENERAL MILLS
EAST HENNEPIN AVENUE SITE

INTRODUCTION

This report summarizes monitoring data and remedial action operations conducted at the East Hennepin Avenue site during 1990, and presents a recommended monitoring plan for 1991. The 1990 monitoring was carried out in response to the requirements of Part II of Exhibit A to the October 23, 1984 Response Order by Consent between General Mills and the Minnesota Pollution Control Agency (MPCA); the January 1985 Groundwater Pump-out System Plan - General Mills East Hennepin Avenue Site; the Minnesota Department of Natural Resources Water Appropriation Permits (85-6144 and 85-6145); the NPDES Permit MN 0056022; and, the 1990 Monitoring Plan. The East Hennepin Avenue site is located in Minneapolis, Minnesota (Figure 1). The generalized geologic column for the site is shown in Figure 2.

REMEDIAL ACTION OPERATIONS

The following section summarizes the remedial action operation and maintenance activities conducted at the East Hennepin Avenue site during 1990. The 1990 remedial actions consisted of operation of the groundwater pump-out systems, and the groundwater treatment system.

Groundwater Pump-Out Systems

The East Hennepin Avenue site groundwater pump-out systems consist of the site glacial drift pump-out system (pump-out Wells 109 and 110), the site Carimona pump-out system (Well 108), and the downgradient glacial drift pump-out system (pump-out Wells 111, 112, and 113).

The site glacial drift pump-out system is designed to contain and remove groundwater with a concentration of trichloroethene exceeding 270 µg/L from the glacial drift aquifer. The site Carimona pump-out system is designed to contain and remove groundwater with a concentration of trichloroethene exceeding 27 µg/L from the Carimona Member of the Platteville Formation. The site Carimona pump-out system also removes groundwater from the Magnolia Member of the Platteville Formation. Groundwater removed by both site pump-out well systems is treated by air stripping. The effluent from the air stripper is discharged to the Minneapolis storm sewer network. The site area pump-out system began operation on November 1, 1985.

The downgradient glacial drift pump-out system is designed to contain and remove groundwater with a concentration of trichloroethene exceeding 270 µg/L from the glacial drift aquifer. Groundwater removed by the downgradient pump-out well system is directly discharged to the Minneapolis storm sewer network. Passive air stripping occurs in the storm sewer between the downgradient pump-out system discharge point and the Mississippi River. The downgradient pump-out system began operation on December 5, 1985.

The average monthly pumping rate for each of the pump-out wells is presented in Table 1. The combined average pumping rate for the site glacial drift pump-out well system during 1990 was 58 gallons per minute. The average monthly pumping rates for the individual pump-out wells ranged from 0 to 65 gallons per minute. A total volume of 31 million gallons of groundwater was removed from the glacial drift aquifer during 1990. The average pumping rate for the site Carimona pump-out system was 11 gallons per minute. A total volume of 5.7 million gallons of groundwater was removed from the Carimona and Magnolia Members of the Platteville Formation during 1990. The site area pump-out system operated at a combined yearly average running time of 68 percent.

The downgradient pump-out well system operated at a combined annual average rate of 270 gallons per minute. The average monthly pumping rates for the individual downgradient pump-out wells ranged from 34 to 113 gallons per minute. A total volume of 142 million gallons of groundwater was removed from the glacial drift aquifer during 1990.

The downgradient pump-out system operated at a combined yearly average running time of 97 percent.

Maintenance and Downtime

The site and downgradient pump-out wells were operated continuously at the maximum sustainable yield of the pumps or aquifer during 1990, with the exception of shutdowns caused by electrical or mechanical failures, and the need for well maintenance. The 1990 operating and downtime for the glacial drift and Carimona Member pump-out wells is presented in Table 2.

The site pump-out wells were not operating between the period January 19, 1990 through April 18, 1990 due to the shutdown, cleanout, and repacking of the stripper tower. The site area pump-out system operated at a combined average running time of 91 percent during the remainder of 1990.

A power failure resulted in two days of downtime during July 1990 for the site pump-out system.

The discharge line repair for Carimona Member pump-out Well 108 resulted in an additional 15 days of downtime during January 1990. Redevelopment of Well 108 resulted in 2 days of downtime during December 1990.

A pump replacement in Well 109 resulted in 18 days of downtime during September 1990 and 6 days of downtime during October 1990. Redevelopment of Well 109 resulted in 8 days of downtime during December 1990.

A pump replacement in Well 110 and redevelopment resulted in 14 days of downtime during November 1990 and 9 days during December 1990.

A pump replacement in Well 112 and redevelopment resulted in 18 days of downtime during March 1990. A pump replacement in Well 113 resulted in 18 days of downtime during September 1990.

Wells 108 and 109 are located on privately-owned property. A full-time caretaker was on the site during the period January 1, 1990 through April 1, 1990. Access to the property was limited during the remainder of 1990 due to the property owners closure of the site facility.

Groundwater Treatment System

The groundwater treatment system consists of a stripper tower located at the former disposal site. The tower is designed to remove 99 percent of volatile organic compounds from influent groundwater at a discharge rate of 150 gpm. The groundwater treatment system is required to treat influent groundwater to a concentration of trichloroethene not to exceed 50 µg/L, and a daily maximum concentration of trichloroethene not to exceed 100 µg/L. The tower receives influent from glacial drift pump-out Wells 109 and 110 and from Carimona Member pump-out Well 108. The stripper tower began operation on November 11, 1985 and has operated continuously within NPDES permit standards during the period April 18, 1990 through December 31, 1990.

The site pump-out system and groundwater treatment system were shut down on January 19, 1990 due to a loss of treatment efficiency. Following shutdown, the stripper tower's interior was inspected (January 19, 1990). The inspection indicated that calcium and magnesium carbonate precipitate had completely filled the tower. The cleaning and repacking of the tower was completed on April 18, 1990. The spent stripper tower packing material and calcium/magnesium carbonate precipitates were disposed of at a local licensed disposal facility.

GROUNDWATER MONITORING

Water Level Monitoring

The 1990 monitoring program involved the measurement of water levels from fourteen monitoring wells screened in the glacial drift; five pump-out wells screened in the glacial drift; eleven monitoring wells open to the Carimona Member of the Platteville Formation; one pump-out well open to the Carimona Member of the Platteville Formation; five wells open to the Magnolia Member of the Platteville Formation; and, four wells screened in the St. Peter Sandstone. All monitoring activities were carried out in accordance with the 1990 Monitoring Plan and the 1985 Quality Assurance/Quality Control Plan.

The results from 1990 water level monitoring are presented in the following sections. Historical water elevation data for the glacial drift wells, Carimona Member wells, Magnolia Member wells, St. Peter wells, and pump-out wells are presented in Appendix C.

Glacial Drift

Groundwater elevations were measured in glacial drift monitoring wells (Figure 3) during May, July, and October 1990. The results from 1990 water level monitoring are presented in Table 3. A cross section of the glacial drift groundwater surface for the three monitoring periods is shown in Figure 4. The location of cross section A-A′ is shown on Figure 3. The glacial drift groundwater contours and the estimated capture zone limits for the site glacial drift pump-out system for each monitoring period are shown in Figures 5 through 7.

The groundwater elevation data indicate the direction of groundwater flow in the glacial drift is to the southwest. The 1990 data also indicate the groundwater elevations in the glacial drift are slightly higher than the drought years of 1988 and 1989.

Water level measurements collected during 1985-1986, following start-up of the groundwater containment system, demonstrated the effectiveness of the site and downgradient pump-out systems in containment of those areas of the glacial drift groundwater with volatile organic compound concentrations greater than 270 µg/L. Glacial drift groundwater elevation data collected during 1990 indicate the capture zone established during 1985 and 1986 following start-up of the pump-out systems has been maintained with the exception of the time period necessary for stripper tower maintenance.

Carimona Member of Platteville Formation

Groundwater elevations were measured in the Carimona Member monitoring wells during May, July, and October 1990 at the locations shown in Figure 8. The results from 1990 water level monitoring are presented in Table 4. The Carimona potentiometric surface elevations for each monitoring period are shown in Figures 9 through 11.

The potentiometric surface elevation of the Carimona in the vicinity of the East Hennepin Avenue Site during 1990 was essentially flat. The results of potentiometric surface elevation monitoring collected from Carimona Member monitoring wells prior to 1990 also indicate a flat potentiometric surface. The average annual fluctuation of the potentiometric surface for the Carimona during 1990 was 1.3 feet. The data indicate a significant change in the slope of the Carimona's potentiometric surface has not occurred in 1990.

Water level data for the Carimona Member cannot be used to determine the real extent of the Carimona pump-out system because of the very low observed hydraulic gradients across the site. The 1990 water level data suggest hydraulic gradients throughout the monitored area are toward the Carimona Member pump-out Well 108.

Magnolia Member of Platteville Formation

The potentiometric surface elevations were measured in the Magnolia Member monitoring wells (Figure 12) during May, July, and October 1990. The results from 1990

water level monitoring are presented in Table 5. The Magnolia potentiometric surface elevations for each monitoring period are shown in Figures 13 through 15.

The 1990 potentiometric surface elevation data indicate the direction of groundwater flow in the Magnolia Member is to the northwest with a hydraulic gradient of 0.005 feet/foot. The 1990 data is consistent with the potentiometric surface elevation data collected during prior monitoring years.

St. Peter Sandstone

The potentiometric surface elevations were measured in the St. Peter Sandstone monitoring wells (Figure 16) during May, July, and October 1990. The results from 1990 water level monitoring are presented in Table 6. The St. Peter potentiometric surface elevations for each monitoring period are shown in Figures 17 through 19.

The 1990 potentiometric surface elevation data indicate the general direction of groundwater flow in the St. Peter Sandstone is to the southwest. The 1990 data is consistent with the potentiometric surface elevation data collected during prior monitoring years.

Water Quality Monitoring

The 1990 monitoring program involved the collection of water quality samples from monitoring wells screened in the glacial drift aquifer; wells open to the Carimona Member of the Platteville Formation; wells open to the Magnolia Member of the Platteville Formation; and wells screened in the St. Peter Sandstone. The monitoring activities were carried out in accordance with the 1990 Monitoring Plan and the 1985 Quality Assurance/Quality Control Plan.

The results from 1990 water quality monitoring are presented in the following section. Historical water quality data for glacial drift wells, Carimona Member wells, Magnolia

Member wells, St. Peter Sandstone wells, Prairie du Chien/Jordan well, pump-out wells, and the groundwater treatment system influent and effluent are presented in Appendix C.

Glacial Drift

The 1990 monitoring plan indicated that groundwater samples would be collected from eleven glacial drift monitoring wells during May 1990 and from six glacial drift monitoring wells during July and October 1990. This plan was modified due to lack of access to the former Henkel Corporation property during May 1990. Wells B and 1 were sampled in July 1990 instead of May 1990. Well R was dry during the May 1990, July 1990, and October 1990 monitoring events, therefore, no samples were collected. Well X contained an insufficient volume of water to sample during the May 1990 monitoring event. Samples collected during July 1990 were analyzed for trichloroethene (TCE), except for the samples collected from Wells B and 1 which were analyzed for the parameters shown in Table 7. Samples collected during October 1990 were analyzed for TCE. The results from the laboratory analysis are presented in Table 8. The reported concentrations of TCE and the sum of volatile organic compounds (VOCs) are also shown in Figure 20 through 23. The 1985 through 1990 TCE concentrations for glacial drift Wells Q, R, S, T, X, 1, B, V, 3, and 4 are shown in Figure 24.

Carimona Member of Platteville Formation

Groundwater samples were to be collected from eleven monitoring wells open to the Carimona Member of the Platteville Formation during May 1990, and from four Carimona Member monitoring wells during July and October 1990. Because of inaccessibility to the site during May 1990, Well BB was sampled during July 1990. Groundwater samples were also collected from pump-out Well 108 during May, July, and October 1990. The samples collected during May 1990 and the sample from Well BB collected during July 1990 were analyzed for the parameters shown in Table 7. The samples collected in July and October 1990 were analyzed for TCE. The results from the laboratory analysis are presented in Table 9. The concentration of TCE and the sum of VOCs are also shown in Figures 25 through

28. The 1985 through 1990 TCE concentrations for Carimona Wells BB, WW, 10, 11, 13, and 108 are shown in Figure 29.

Magnolia Member of Platteville Formation

Groundwater samples were collected from five monitoring wells open to the Magnolia Member of the Platteville Formation during May 1990, and from three Magnolia Member monitoring wells during July and October 1990. The samples collected during May 1990 were analyzed for the parameters shown in Table 7. The samples collected during July and October were analyzed for TCE. The results from the laboratory analysis are presented in Table 10. The concentration of TCE and the sum of VOCs are also shown in Figures 30 through 33. The 1985 through 1990 TCE concentrations for Magnolia Member Wells OO, VV, and ZZ are shown in Figure 34.

St. Peter Sandstone

Groundwater samples were collected from St. Peter Sandstone monitoring Well 200 during May, July, and October 1990. Groundwater samples were collected from St. Peter Sandstone monitoring Wells 201, 202, and 203 during May 1990. Samples collected during May were analyzed for the parameters shown in Table 7. Samples collected during July and October were analyzed for TCE. The results from the laboratory analysis are presented in Table 11. The concentration of TCE and the sum of VOCs are shown in Figures 35 through 38.

Prairie du Chien/Jordan

Due to the shutdown of the former Henkel Corporation facility (including disconnection of electricity, shutdown of the well, and draining of water lines) during 1990, no water quality samples were collected.

Downgradient Groundwater Pump-Out System

Flow weighted composite groundwater samples were collected from the downgradient pump-out well system discharge during January, May, July, and October 1990. The samples collected during May and October 1990 were analyzed for the parameters shown in Table 12. The samples collected during January and July 1990 were analyzed for TCE. The results from the laboratory analysis are presented in Table 13. The 1985 through 1990 TCE concentrations for the downgradient groundwater pump-out system discharge are shown in Figure 39.

Site Groundwater Pump-Out & Groundwater Treatment System

Groundwater treatment system influent and effluent samples were collected during January, May, July, and October 1990. The samples collected during May 1990 were analyzed for the volatile fraction priority pollutants. The samples collected during October 1990 were analyzed for VOCs using EPA Method 601. The samples collected during January and July were analyzed for TCE. The results from the laboratory analysis are presented in Table 14 and 15. The 1985 through 1990 TCE concentrations for the groundwater treatment system influent/effluent are shown in Figure 39.

QUALITY ASSURANCE PROCEDURES

Quality assurance procedures described in the February 1985 Quality Assurance/Quality Control (QA/QC) Plan were followed during collection and analysis of the water quality samples. Quality assurance procedures involved internal and external quality review procedures. The results from the quality review are presented in Appendix A.

DISCUSSION OF RESULTS

This section discusses the water quality data results for samples collected from glacial drift wells, Carimona Member wells, Magnolia Member wells, St. Peter Sandstone wells,

groundwater pump-out system wells, and the groundwater treatment system. Historical water quality data for each monitoring location are presented in Appendix C.

Glacial Drift

The results from the analysis of groundwater samples collected from glacial drift monitoring wells are similar to water quality data reported during 1988 and 1989. The 1990 data indicate the downgradient glacial drift pump-out system is capturing glacial drift groundwater with a concentration of TCE exceeding 270 µg/L; and, the site glacial drift pump-out system remains an effective control for the containment of the groundwater contaminants located in the vicinity of the site.

Carimona Member of Platteville Formation

The TCE concentration of groundwater samples collected from the Carimona Member wells during 1990 range from below the laboratory detection limit to 570 µg/L. The total VOCs concentration range from below the laboratory detection limit to 640 µg/L.

The results from the analysis of groundwater samples collected from Carimona Member Wells BB, 8, 10, and WW indicate TCE concentrations have declined since the start-up of the Carimona Member pump-out system in 1985. The results from the analysis of groundwater samples collected from Wells RR, SS, UU, 9, and 12 during the period 1985 through 1990 indicate TCE concentrations are similar.

The results from the analysis of groundwater samples collected from Wells 11 and 13 during 1985 through 1989 show considerable variability. The TCE concentration of groundwater samples collected from Well 11 range from below the laboratory detection limit (May 1990) to 520 µg/L (December 1985). The TCE concentration of groundwater samples collected from Well 13 range from below the laboratory detection limit (April 1988) to 140 µg/L (April 1987). The groundwater quality in the vicinity of Carimona Member Well 13 appears to be adversely impacted by leakage of Magnolia Member groundwater to the

Carimona. The vertical gradient in this vicinity is upwards from the Magnolia Member to the Carimona Member of the Platteville Formation. The concentration of TCE in the samples of groundwater collected from Magnolia Member Well ZZ is consistently higher than the concentration of TCE in samples collected from Carimona Member Well 13. Carimona Member Well 13 and Magnolia Member Well ZZ are part of a well nest located at the corner of 21st Avenue Southeast and Fairmont.

Magnolia Member of Platteville Formation

The TCE concentration of groundwater samples collected from the Magnolia Member wells during 1990 ranges from 3.4 to 120 µg/L. The VOCs concentration range from 5.8 to 140 µg/L. The highest concentrations of TCE were reported for samples collected from Magnolia Member Wells OO, VV, and ZZ. These wells are located upgradient of the former disposal area, and the water quality of samples collected from these wells appears to be adversely impacted by an unknown contaminant source located to the southeast of the East Hennepin Avenue site.

St. Peter Sandstone

The results from the analysis of groundwater samples collected from the St. Peter wells during 1990 indicate concentrations of TCE in Wells 201, 202, and 203 were either trace or below laboratory detection limits. The results from analysis of samples collected from Well 200 during 1990 indicate concentrations of TCE range from 11 to 130 µg/L. The results from the analysis of groundwater samples collected during the period 1985 through 1990 from Wells 200, 201, 202, and 203 indicate TCE concentrations are similar.

Prairie du Chien/Jordan

Groundwater samples were not collected from the Henkel well during 1990. The well was shutdown by the Henkel Corporation during 1990. The facility is not heated and temporary access could not be arranged.

Groundwater Pump-Out System

The results from the analysis of samples collected quarterly from the site pump-out system indicate the average influent concentration of TCE was 350 µg/L and the average influent concentration of VOCs was 360 µg/L. The highest concentration of TCE reported in site pump-out system influent samples during 1990 was 380 µg/L. The maximum total concentration of VOCs reported was 390 µg/L. The results of influent samples collected during the period 1985 through 1990 indicate the concentration of VOCs have declined.

The volatile fraction priority pollutant data and the routine volatile organic data indicate TCE is the primary volatile organic compound present in the groundwater at the East Hennepin Avenue site. The data also indicate the presence of nine other VOCs including: methylene chloride, acetone, 1,2-dichloroethylene (cis/trans), chloroform, methyl ethyl ketone, benzene, tetrachloroethylene, toluene, and xylenes. Methylene chloride and acetone are likely laboratory contaminants.

The average concentration of TCE reported for samples collected from the downgradient pump-out system discharge was 160 µg/L, the average total concentration of VOCs was 170 µg/L. The highest concentration of TCE reported during 1990 was 220 µg/L and the highest concentration of total VOCs reported during 1990 was 250 µg/L. The results from the analysis of discharge samples collected during the period 1985 through 1990 indicate the concentration of VOCs are similar.

Groundwater Treatment System

The results from the laboratory analysis of samples collected on January 16, 1990 indicate the treatment system effluent concentration of TCE was 96 µg/L. This concentration exceeded the NPDES permit maximum allowable average TCE concentration (50 µg/L). In response to this data, the site pump-out and groundwater treatment systems were shut down on January 19, 1990. The stripper tower was cleaned, repacked, and the site pump-out and groundwater treatment systems were restarted on April 18, 1990.

The average concentration of TCE reported for samples collected during the second, third, and fourth quarters of 1990 from the effluent of the groundwater treatment system was 1.7 µg/L, and the average total concentration of VOCs was 1.7 µg/L. The maximum TCE concentration reported was 2.9 µg/L and the maximum total concentration of VOCs was 2.9 µg/L. The data collected during the second, third, and fourth quarters of 1990 indicate the average treatment efficiency of the groundwater treatment system is 99 percent removal of volatile organic compounds.

SUMMARY AND CONCLUSIONS

Water level data collected in the glacial drift indicate the capture zone established in this aquifer during 1985 and 1986 has been maintained in 1990 with the exception of the period January 19, 1990 through April 18, 1990. This period correlates to the time period necessary to repair the site groundwater treatment system. Water quality data indicate continued containment of groundwater with a concentration of TCE exceeding 270 µg/L in the glacial drift aquifer.

Water level data collected in the Carimona Member of the Platteville Formation indicate the capture zone established in this aquifer during 1985 and 1986 was lost during the stripper tower cleanout and repacking (105 days), but was maintained throughout the remainder of 1990.

Water level data collected in the Magnolia Member indicates Carimona pump-out Well 108 is capturing Magnolia Member groundwater. Magnolia Member water quality and water level data indicate the primary source of TCE in the Magnolia Member originates from a contaminant source located upgradient of the East Hennepin Avenue Site with respect to Magnolia Member groundwater flow directions.

Water quality data collected from the St. Peter Wells indicate the continued presence of VOCs in the St. Peter Sandstone aquifer.

RECOMMENDATIONS

1. Continued operation of the site pump-out and groundwater treatment systems in accordance with the 1985 Consent Order; the 1985 Groundwater Pump-Out System Plan; the Department of Natural Resources Water Appropriation Permits; and, the 1991 Monitoring Plan (Appendix B).

2. Monitoring of groundwater elevations and groundwater quality in accordance with the 1991 Monitoring Plan (Appendix B).

3. Abandonment of monitoring wells excluded from the 1991 Monitoring Plan.

4. Ongoing inspection and maintenance of the groundwater pump-out and treatment system.

Tables

TABLE 1

1990 PUMPING RATES
PUMP-OUT WELLS

	Glacial Drift Pump-Out Well Average Pumping Rate (GPM)					Carimona Pump-Out Well Average Pumping Rate (GPM)
	109	110	111	112	113	108
Jan 1990	27[2]	14[2]	90	106	93	0.6[2]
Feb 1990	0[3]	0[3]	90	34[2]	91	0[3]
Mar 1990	0[3]	0[3]	91	47[2]	91	0[3]
Apr 1990	17[2]	8.8[2]	91	113	91	6.2[2]
May 1990	47	24	90	106[1]	90	18
Jun 1990	54	31	90	105[1]	90	18
Jul 1990	54	28[2]	91	105[1]	91	16
Aug 1990	65	30[1]	91	111	91	16
Sep 1990	34[2]	30[1]	91	61[2]	40[2]	15
Oct 1990	47[2]	30	91	106	92	16
Nov 1990	61	17[1,2]	91	106	91	15
Dec 1990	36[2]	42[2]	91	105	91	9.8[2]
Annual Average Pumping Rate (gpm)	37	21	91	92	87	11

[1]Flow meter malfunction, estimated flow rate
[2]Well not pumping full-time
[3]Well not pumping due to cleanout and repacking of stripper tower

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TABLE 2

1990 OPERATING AND DOWNTIME
PUMP-OUT WELLS

	Glacial Drift Pump-Out Well Downtime (Days)					Carimona Pump-Out Well Downtime (Days)
	109	110	111	112	113	108
Jan 1990	13[1]	13[1]	0	0	0	28[1,5]
Feb 1990	28[1]	28[1]	0	0	0	28[1]
Mar 1990	31[1]	31[1]	0	18[3,4]	0	31[1]
Apr 1990	18[1]	18[1]	0	0	0	18[1]
May 1990	0	0	0	0	0	0
Jun 1990	0	0	0	0	0	0
Jul 1990	2[2]	2[2]	0	0	0	2[2]
Aug 1990	0	0	0	0	0	0
Sep 1990	18[3]	0	0	0	18[3]	0
Oct 1990	6[3,4]	0	0	0	0	0
Nov 1990	0	14[3,4]	0	0	0	0
Dec 1990	8	9	0	0	0	2[4]
Percent (%) Operating Time	66	71	100	95	95	70

[1]Stripper tower cleanout and repacking.
[2]Power failure.
[3]Pump failure and replacement.
[4]Well redevelopment.
[5]Discharge line repair.

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TABLE 3

1990 GROUNDWATER ELEVATIONS
GLACIAL DRIFT WELLS

(elevations in feet/MSL)

DATE	1	3	4	106	107
05/14/90	-- (2)	833.65	830.43	--	--.
07/10/90	841.90	834.35	--	836.36	836.17
10/08/90	841.69	834.15	--	--	--

DATE	109 (1)	110 (1)	111 (1)	112 (1)	113 (1)
05/14/90	-- (2)	830.71	818.20	807.67	817.96
07/10/90	827.27	831.02	819.07	811.77	818.80
10/08/90	829.63	831.51	819.23	811.03	819.12

DATE	B	Q	R	S	T
05/14/90	-- (2)	827.08	DRY	825.92	832.14
07/10/90	844.33	828.50	DRY	827.38	832.89
10/08/90	--	828.28	DRY	827.43	832.62

DATE	U	V	W	X
05/14/90	835.86	814.64	814.38	822.07
07/10/90	--	816.65	816.75	822.95
10/08/90	--	816.70	816.80	823.08

-- Not measured.
(1) Pumping well.
(2) Measurement not collected due to restricted site access.

2,.003

TABLE 4

1990 GROUNDWATER ELEVATIONS
CARIMONA MEMBER WELLS

(elevations in feet/MSL)

DATE	8	9	10	11	12
05/14/90	827.06	827.38	827.26	827.31	827.52
07/10/90	827.92	828.18	828.10	827.84	826.73
10/08/90	828.38	828.59	828.58	828.41	828.23

DATE	13	108 (1)	BB	RR	SS
05/14/90	826.65	-- (2)	-- (2)	827.41	824.77
07/10/90	827.20	804.54	828.01	827.98	827.05
10/08/90	827.78	804.64	--	828.48	826.74

DATE	UU	WW
05/14/90	827.28	827.27
07/10/90	--	--
10/08/90	--	--

-- Not measured.
(1) Pumping well.
(2) Measurement not collected due to restricted site access.

2,.002

TABLE 5

1990 GROUNDWATER ELEVATIONS
MAGNOLIA MEMBER WELLS

(elevations in feet/MSL)

	OO	QQ	TT	VV	ZZ
DATE					
05/14/90	822.79	822.51	820.42	823.65	828.04
07/10/90	823.67	823.36	821.35	824.57	828.65
10/08/90	823.99	823.73	821.56	824.88	829.16

2,.001

TABLE 6

1990 GROUNDWATER ELEVATIONS
ST. PETER SANDSTONE WELLS

(elevations in feet/MSL)

DATE	200	201	202	203
05/14/90	761.79	778.59	753.72	753.29
07/10/90	759.54	776.15	753.16	752.61
10/08/90	759.90	776.67	752.44	751.93

2,.004

TABLE 7

1990 WATER QUALITY
ANALYTICAL PARAMETERS

Chlorinated Volatile Solvents

1,1-Dichloroethane

1,2-Dichloroethane

1,2-Dichloroethylene, cis

1,2-Dichloroethylene, trans

1,1,2,2-Tetrachloroethane

Tetrachloroethylene

1,1,1-Trichloroethane

Trichloroethene

TABLE 8

1990 WATER QUALITY DATA
GLACIAL DRIFT WELLS

(concentrations in ug/L)

	B			Q	R		
	05/14/90(1)	07/13/90		05/14/90	05/14/90	07/11/90	10/09/90
1,1-Dichloroethane	--	2.5		1.5	--	--	--
1,2-Dichloroethane	--	<0.4		<0.2	--	--	--
1,2-Dichloroethylene, cis	--	2.3		<0.5	--	--	--
1,2-Dichloroethylene, trans	--	<0.6		<0.3	--	--	--
1,1,2,2-Tetrachloroethane	--	<2.0		<1.0	--	--	--
Tetrachloroethylene	--	9.5		<1.0	--	--	--
1,1,1-Trichloroethane	--	5.6		7.4	--	--	--
Trichloroethene	--	330		0.7	--	--	--
Sum Volatile Organics	--	350		9.6	DRY	DRY	DRY

	S			T	V		
	05/16/90	07/10/90	10/09/90	05/16/90	05/16/90	07/10/90	10/09/90
1,1-Dichloroethane	<2.0	--	--	<0.2	<0.40	--	--
1,2-Dichloroethane	<2.0	--	--	<0.2	<0.40	--	--
1,2-Dichloroethylene, cis	48	--	--	<0.5	10	--	--
1,2-Dichloroethylene, trans	<3.0	--	--	<0.3	0.9	--	--
1,1,2,2-Tetrachloroethane	<10	--	--	<1.0	<2.0	--	--
Tetrachloroethylene	<10	--	--	<1.0	<2.0	--	--
1,1,1-Trichloroethane	5.7	--	--	<0.5	<1.0	--	--
Trichloroethene	710	200	770	<0.5	110	120	110
Sum Volatile Organics	760	200	770	ND	120	120	110

	W			X	1		
	05/16/90	07/10/90	10/09/90	05/16/90(2)	05/14/90(1)	07/13/90	10/08/90
1,1-Dichloroethane	<0.2	--	--	--	--	<0.2	--
1,2-Dichloroethane	<0.2	--	--	--	--	<0.2	--
1,2-Dichloroethylene, cis	19	--	--	--	--	<0.5	--
1,2-Dichloroethylene, trans	0.9	--	--	--	--	<0.3	--
1,1,2,2-Tetrachloroethane	<1.0	--	--	--	--	<1.0	--
Tetrachloroethylene	<1.0	--	--	--	--	5.4	--
1,1,1-Trichloroethane	<0.5	--	--	--	--	<0.5	--
Trichloroethene	31	<0.5	11	--	--	0.8	<0.5
Sum Volatile Organics	51	ND	11	--	--	6.2	ND

	3			4
	05/16/90	07/12/90	10/09/90	05/16/90
1,1-Dichloroethane	8.9	--	--	0.9
1,2-Dichloroethane	<2.0	--	--	<0.2
1,2-Dichloroethylene, cis	11	--	--	2.9
1,2-Dichloroethylene, trans	<3.0	--	--	<0.3
1,1,2,2-Tetrachloroethane	<10	--	--	<1.0
Tetrachloroethylene	<10	--	--	1.9
1,1,1-Trichloroethane	<5.0	--	--	2.3
Trichloroethene	520	770	310	77
Sum Volatile Organics	540	770	310	85

ND None detected.
-- Not analyzed.
(1) Sample not collected due to restricted site access.
(2) Water level measured but insufficient volume to collect sample.

TABLE 9

1990 WATER QUALITY DATA
CARIMONA MEMBER WELLS

(concentrations in ug/L)

	BB		RR	SS	UU	WW	8
	05/14/90(1)	07/13/90	05/16/90	05/16/90	05/16/90	05/16/90	05/15/90
1,1-Dichloroethane	--	8.2	2.3	11	0.6	2.2	<0.5
1,2-Dichloroethane	--	<2.0	<0.2	<0.2	<0.2	<2.0	0.7
1,2-Dichloroethylene, cis	--	31	47	2.0	2.0	44	4.5
1,2-Dichloroethylene, trans	--	<3.0	0.5	0.5	<0.3	3.2	<0.8
1,1,2,2-Tetrachloroethane	--	<10	<1.0	<1.0	<1.0	<10	<2.5
Tetrachloroethylene	--	11	<1.0	<1.0	<1.0	<10	<2.5
1,1,1-Trichloroethane	--	<5.0	0.5	<0.5	1.5	<5.0	2.1
Trichloroethylene	--	530	60	4.1	35	450	100
Sum Volatile Organics	--	580	110	18	39	500	110

	9			10		
	05/15/90	07/11/90	10/09/90	05/15/90	07/11/90	10/09/90
1,1-Dichloroethane	0.8	--	--	0.7	--	--
1,2-Dichloroethane	3.5	--	--	4.0	--	--
1,2-Dichloroethylene, cis	0.7	--	--	17	--	--
1,2-Dichloroethylene, trans	<0.3	--	--	0.9	--	--
1,1,2,2-Tetrachloroethane	<1.0	--	--	<2.5	--	--
Tetrachloroethylene	<1.0	--	--	<2.5	--	--
1,1,1-Trichloroethane	<0.5	--	--	3.0	--	--
Trichloroethylene	8.5	43	9.4	150	180	130
Sum Volatile Organics	14	43	9.4	176	180	130

	11			12		
	05/16/90	07/10/90	10/09/90	05/15/90	07/11/90	10/09/90
1,1-Dichloroethane	0.2	--	--	<0.2	--	--
1,2-Dichloroethane	0.5	--	--	<0.2	--	--
1,2-Dichloroethylene, cis	4.4	--	--	<0.5	--	--
1,2-Dichloroethylene, trans	<0.3	--	--	<0.3	--	--
1,1,2,2-Tetrachloroethane	<1.0	--	--	<1.0	--	--
Tetrachloroethylene	<1.0	--	--	<1.0	--	--
1,1,1-Trichloroethane	<0.5	--	--	<0.5	--	--
Trichloroethylene	<0.5	16	240	0.7	<0.5	<0.5
Sum Volatile Organics	5.1	16	240	0.7	ND	<0.5

	13	108		
	05/16/90	05/16/90	07/11/90	10/09/90
1,1-Dichloroethane	0.6	3.6	--	--
1,2-Dichloroethane	1.7	<2.0	--	--
1,2-Dichloroethylene, cis	12	59	--	--
1,2-Dichloroethylene, trans	1.2	4.5	--	--
1,1,2,2-Tetrachloroethane	<1.0	<10	--	--
Tetrachloroethylene	<1.0	<10	--	--
1,1,1-Trichloroethane	1.8	<5.0	--	--
Trichloroethylene	110	570	400	420
Sum Volatile Organics	130	640	400	420

-- Not analyzed.
(1) Sample not collected due to restricted site access.

TABLE 10

1990 WATER QUALITY DATA
MAGNOLIA MEMBER WELLS

(concentrations in ug/L)

	OO			QQ	TT	VV		
	05/16/90	07/12/90	10/09/90	05/16/90	05/16/90	05/16/90	07/10/90	10/09/90
1,1-Dichloroethane	0.2	--	--	<0.2	0.5	0.3	--	--
1,2-Dichloroethane	0.4	--	--	0.3	<0.2	0.3	--	--
1,2-Dichloroethylene, cis	7.2	--	--	0.9	3.6	3.0	--	--
1,2-Dichloroethylene, trans	1.6	--	--	1.2	<0.3	<0.3	--	--
1,1,2,2-Tetrachloroethane	<1.0	--	--	<1.0	<1.0	<1.0	--	--
Tetrachloroethylene	<1.0	--	--	<1.0	<1.0	<1.0	--	--
1,1,1-Trichloroethane	0.7	--	--	<0.5	<0.5	1.3	--	--
Trichloroethylene	58	62	30	3.4	26	33	27	46
Sum Volatile Organics	68	62	30	5.8	30	38	27	46

	ZZ		
	05/15/90	07/11/90	10/09/90
1,1-Dichloroethane	0.7	--	--
1,2-Dichloroethane	2.0	--	--
1,2-Dichloroethylene, cis	16	--	--
1,2-Dichloroethylene, trans	1.6	--	--
1,1,2,2-Tetrachloroethane	<2.5	--	--
Tetrachloroethylene	<2.5	--	--
1,1,1-Trichloroethane	2.4	--	--
Trichloroethylene	120	61	36
Sum Volatile Organics	140	61	36

-- Not analyzed.

TABLE 11

1990 WATER QUALITY DATA
ST. PETER SANDSTONE WELLS

(concentrations in ug/L)

	200			201	202	203
	05/16/90	07/11/90	10/09/90	05/15/90	05/15/90	05/15/90
1,1-Dichloroethane	0.6	--	--	<0.2	<0.2	<0.2
1,2-Dichloroethane	<0.2	--	--	<0.2	<0.2	<0.2
1,2-Dichloroethylene, cis	10	--	--	<0.5	<0.5	<0.5
1,2-Dichloroethylene, trans	<0.3	--	--	<0.3	<0.3	<0.3
1,1,2,2-Tetrachloroethane	<1.0	--	--	<1.0	<1.0	<1.0
Tetrachloroethylene	<1.0	--	--	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	1.3	--	--	<0.5	<0.5	<0.5
Trichloroethene	110	11*	130	<0.5	0.8	2.8
Sum Volatile Organics	120	11*	130	ND	0.8	2.8

-- Not analyzed.
ND Not detected.
* Value is less than historical average due to possible laboratory error.

TABLE 12

1990 GROUNDWATER PUMP-OUT AND
TREATMENT SYSTEM WATER QUALITY PARAMETERS

Chlorinated Volatile Solvents

1,1-Dichloroethane

1,2-Dichloroethane

1,2-Dichloroethylene, cis

1,2-Dichloroethylene, trans

1,1,2,2-Tetrachloroethane

Tetrachloroethylene

1,1,1-Trichloroethane

Trichloroethene

Non-Chlorinated Volatile Solvents

Benzene

Toluene

Xylenes

TABLE 13

1990 WATER QUALITY DATA
DOWNGRADIANT PUMP-OUT SYSTEM

(concentrations in ug/L)

	DISCHARGE (1)			
	01/16/90	05/16/90	07/12/90	10/10/90
1,1-Dichloroethylene	--	--	--	<5
1,1-Dichloroethane	--	1.4	--	<5
1,2-Dichloroethylene, trans	--	<0.3	--	<5
1,2-Dichloroethylene, cis	--	19	--	<5
1,2-Dichloroethane	--	<0.2	--	<5
1,1,1-Trichloroethane	--	3.6	--	<5
Trichloroethene	140	220	180	100
1,1,2,2-Tetrachloroethane	--	<1.0	--	<5
Tetrachloroethylene	--	3.3	--	<5
Benzene	--	<1.0	--	<5
Toluene	--	<1.0	--	14
Xylenes	--	<1.0	--	<5
Sum of Volatile Organics	140	250	180	110

(1) Pump-out wells 111, 112, 113.
-- Not analyzed.

TABLE 14

1990 WATER QUALITY DATA
SITE PUMP-OUT AND TREATMENT SYSTEM

(concentrations in ug/L)

	INFLUENT (1)				EFFLUENT (2)			
	01/16/90	05/17/90(3)	07/11/90	10/09/90	01/16/90	05/16/90	07/11/90	10/09/90
Chloromethane	--	--	--	<2.0	--	--	--	<2.0
Bromomethane	--	--	--	<1.0	--	--	--	<1.0
Dichlorodifluoromethane	--	--	--	<2.0	--	--	--	<2.0
Vinyl Chloride	--	--	--	<1.0	--	--	--	<1.0
Chloroethane	--	--	--	<0.5	--	--	--	<0.5
Methylene Chloride	--	--	--	<1.0	--	--	--	<1.0
Trichlorofluoromethane	--	--	--	<1.0	--	--	--	<0.5
1,1-Dichloroethylene	--	--	--	<0.5	--	--	--	<0.5
1,1-Dichloroethane	--	--	--	<0.5	--	<0.2	--	<0.5
1,2-Dichloroethylene, trans	--	--	--	<0.5	--	<0.3	--	<0.5
1,2-Dichloroethylene, cis	--	--	--	25	--	<0.5	--	<0.5
Chloroform	--	--	--	<0.5	--	--	--	<0.5
1,2-Dichloroethane	--	--	--	<0.5	--	<0.2	--	<0.5
1,1,1-Trichloroethane	--	--	--	<0.5	--	<0.5	--	<0.5
Carbon Tetrachloride	--	--	--	<0.5	--	--	--	<0.5
Bromodichloromethane	--	--	--	<0.5	--	--	--	<0.5
1,2-Dichloropropane	--	--	--	<0.5	--	--	--	<0.5
Trans-1,3-Dichloro-1-propene	--	--	--	<0.5	--	--	--	<0.5
Trichloroethene	380	--	310	360	96	1.2	0.9	2.9
Chlorodibromomethane	--	--	--	<0.5	--	--	--	<0.5
1,1,2-Trichloroethane	--	--	--	<0.5	--	--	--	<0.5
Cis-1,3-Dichloro-1-propene	--	--	--	<0.5	--	--	--	<0.5
Bromoform	--	--	--	<0.5	--	--	--	<0.5
1,1,2,2-Tetrachloroethane	--	--	--	<0.5	--	<1.0	--	<0.5
Tetrachloroethylene	--	--	--	<0.5	--	<1.0	--	<0.5
Benzene	--	--	--	7.4	--	<1.0	--	<0.5
Toluene	--	--	--	15	--	<1.0	--	<1.0
Chlorobenzene	--	--	--	1.1	--	--	--	<0.5
Ethyl Benzene	--	--	--	1.8	--	--	--	<0.5
Xylenes	--	--	--	7.7	--	<1.0	--	<0.5
1,3-Dichlorobenzene	--	--	--	<0.5	--	--	--	<0.5
1,4-Dichlorobenzene	--	--	--	<0.5	--	--	--	<0.5
1,2-Dichlorobenzene	--	--	--	<0.5	--	--	--	<0.5
Sum of Volatile Organics	380	--	310	390	96	1.2	0.9	2.9

(1) Pump-out wells 108, 109, 110.
(2) Effluent from treatment system.
(3) See Table 14.
-- Not analyzed.

.010

TABLE 15

WATER QUALITY DATA
PRIORITY POLLUTANT VOLATILE ORGANIC ANALYSIS
EPA METHOD 624
SITE PUMP-OUT SYSTEM
May 17, 1990

(concentrations in ug/L)

	INFLUENT(1)	TRIP BLANK
	05/17/90	05/17/90
Chloromethane	<25	<10
Bromomethane	<25	<10
Vinyl Chloride	<25	<10
Chloroethane	<25	<10
Methylene Chloride	40 s	22
Acetone	48 s	16
Carbondisulfide	<12	<5
Trichlorofluoromethane	<12	<5
1,1-Dichloroethylene	<12	<5
1,1-Dichloroethane	<12	<5
1,2-Dichloroethylene (cis/trans)	33	<5
Chloroform	5 j	<5
1,2-Dichloroethane	<12	<5
Methyl Ethyl Ketone	110	<10
1,1,1-Trichloroethane	<12	<5
Carbon Tetrachloride	<12	<5
Vinyl Acetate (Vinyl Ester)	<25	<10
Bromodichloromethane	<12	<5
1,2-Dichloropropane	<12	<5
Cis-1,3-Dichloro-1-propene	<12	<5
Trichloroethylene	370	<5
Chlorodibromomethane	<12	<5
1,1,2-Trichloroethane	<12	<5
Benzene	10 j	<5
Trans-1,3-Dichloro-1-propene	<12	<5
2-Chloroethylvinyl Ether	<25	<10
Bromoform	<12	<5
2-Hexanone	<25	<10
Methyl Isobutyl Ketone	<25	<10
Tetrachloroethylene	6 j	<5
1,1,2,2-Tetrachloroethane	<12	<5
Toluene	18	1 j
Chlorobenzene	<12	<5
Ethyl Benzene	<12	<5
Styrene	<12	<5
Xylenes	6 j	<5
1,3-Dichlorobenzene	<12	<5
1,4-Dichlorobenzene	<12	<5
1,2-Dichlorobenzene	<12	<5
Tetrahydrofuran	<12	<5
Sum Volatile Organics	560	40

1 Flow rate weighted composite sample (Pump-Out Wells 108, 109 and 110)
j Reported value is less than quanitation limit.
s Potential false positive value based on data validation procedure.
-- Not analyzed.

Figures

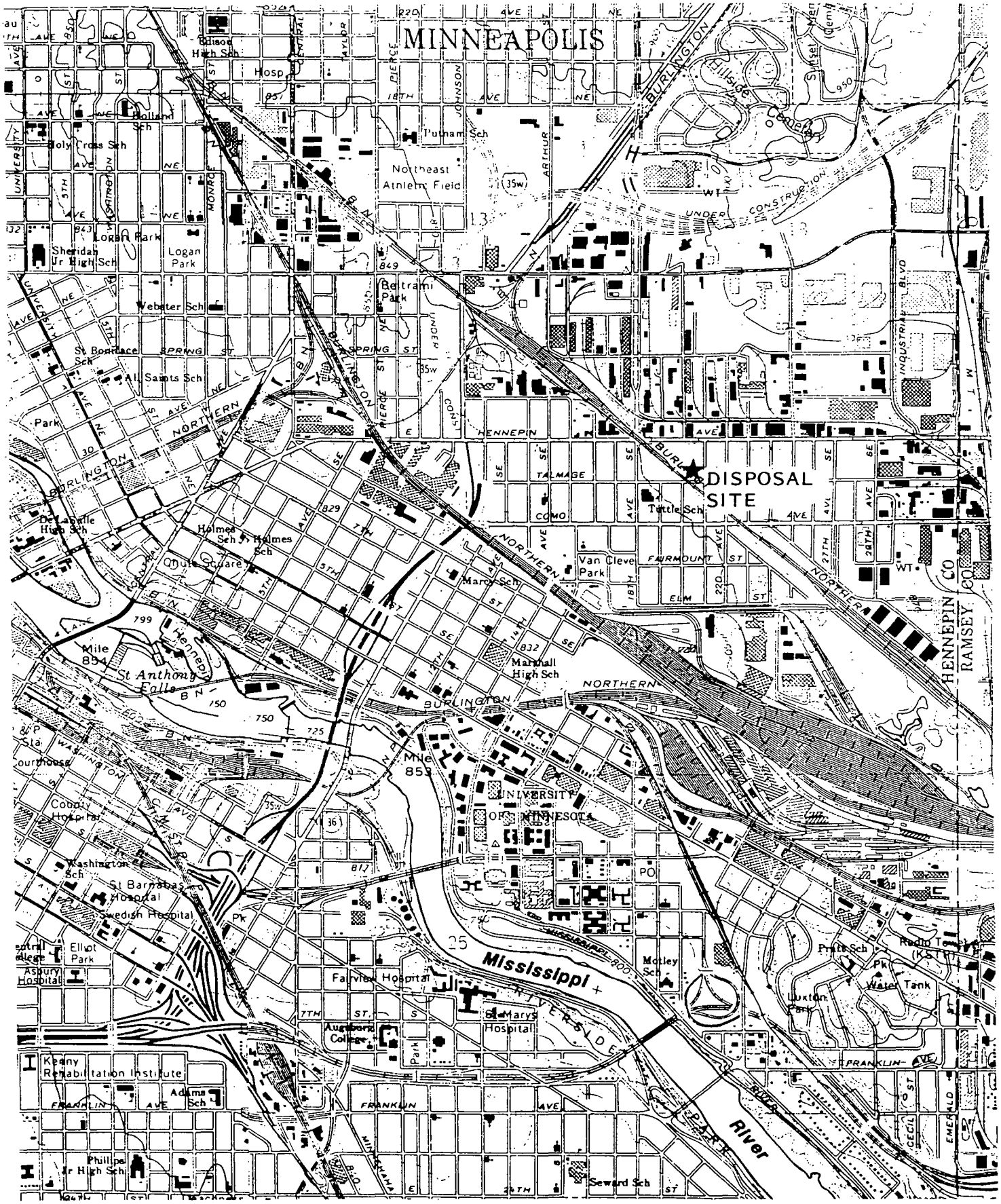


Figure 1

LOCATION OF DISPOSAL SITE

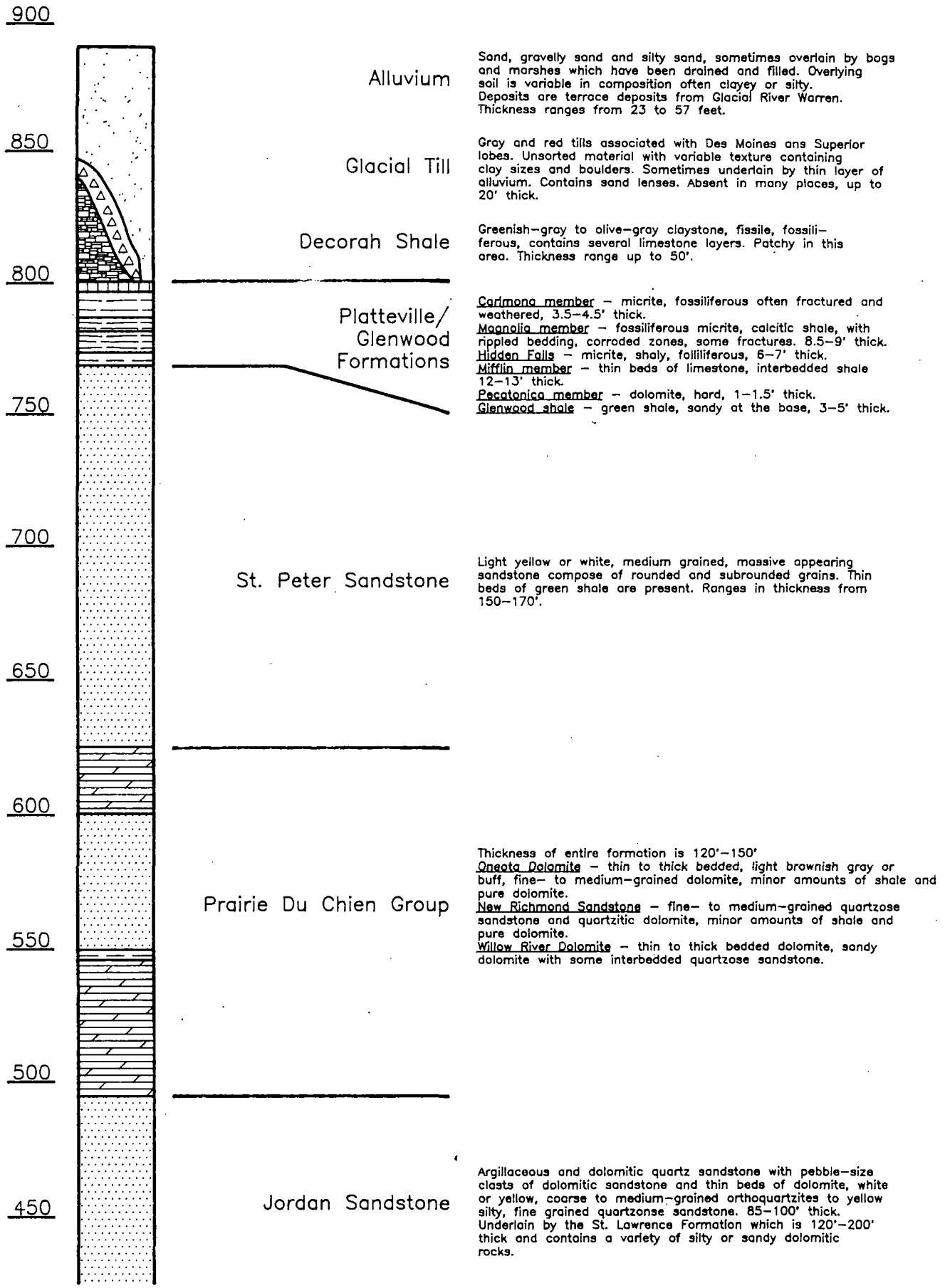


Figure 2

GENERALIZED GEOLOGIC COLUMN

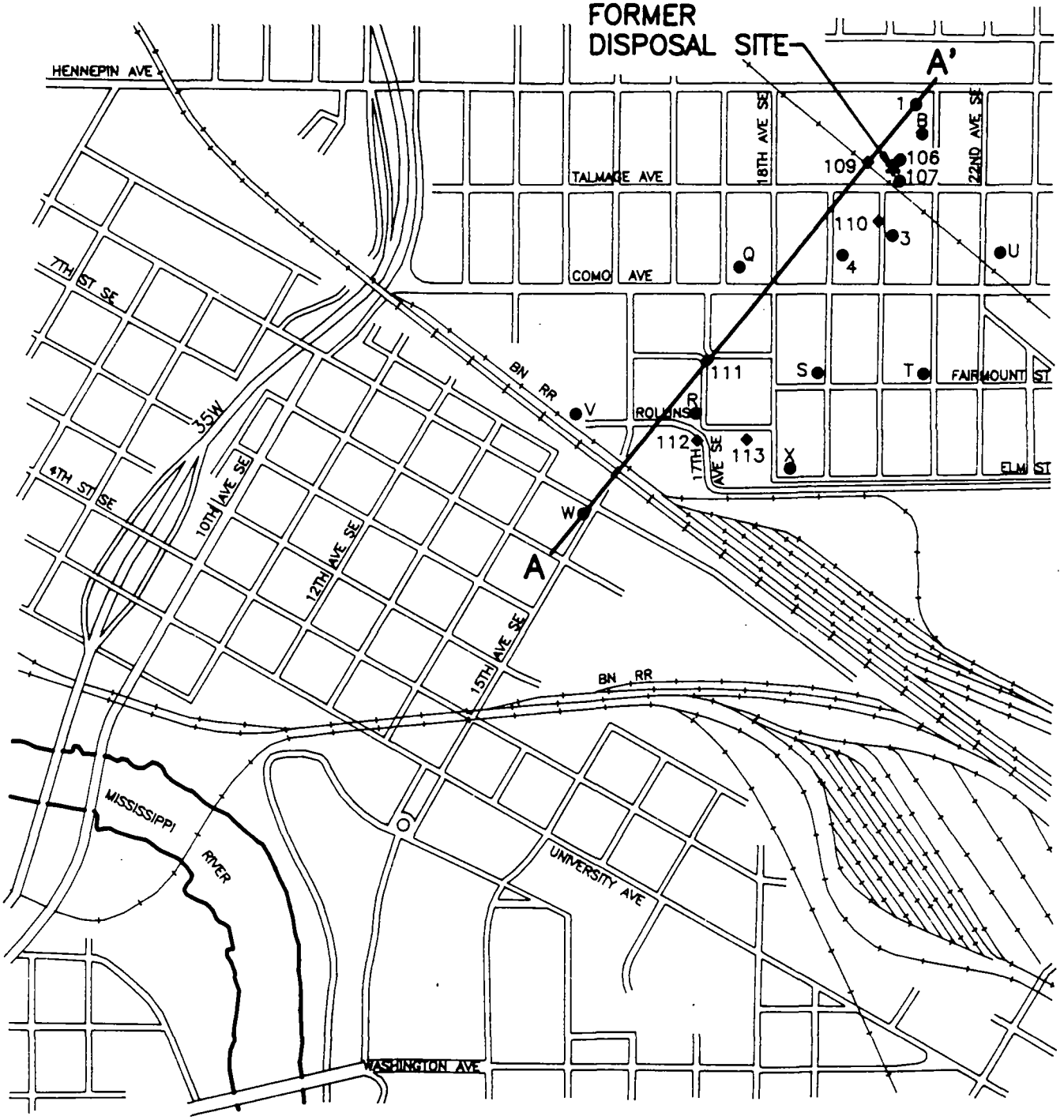


Figure 3
1990 MONITORING LOCATIONS
GLACIAL DRIFT

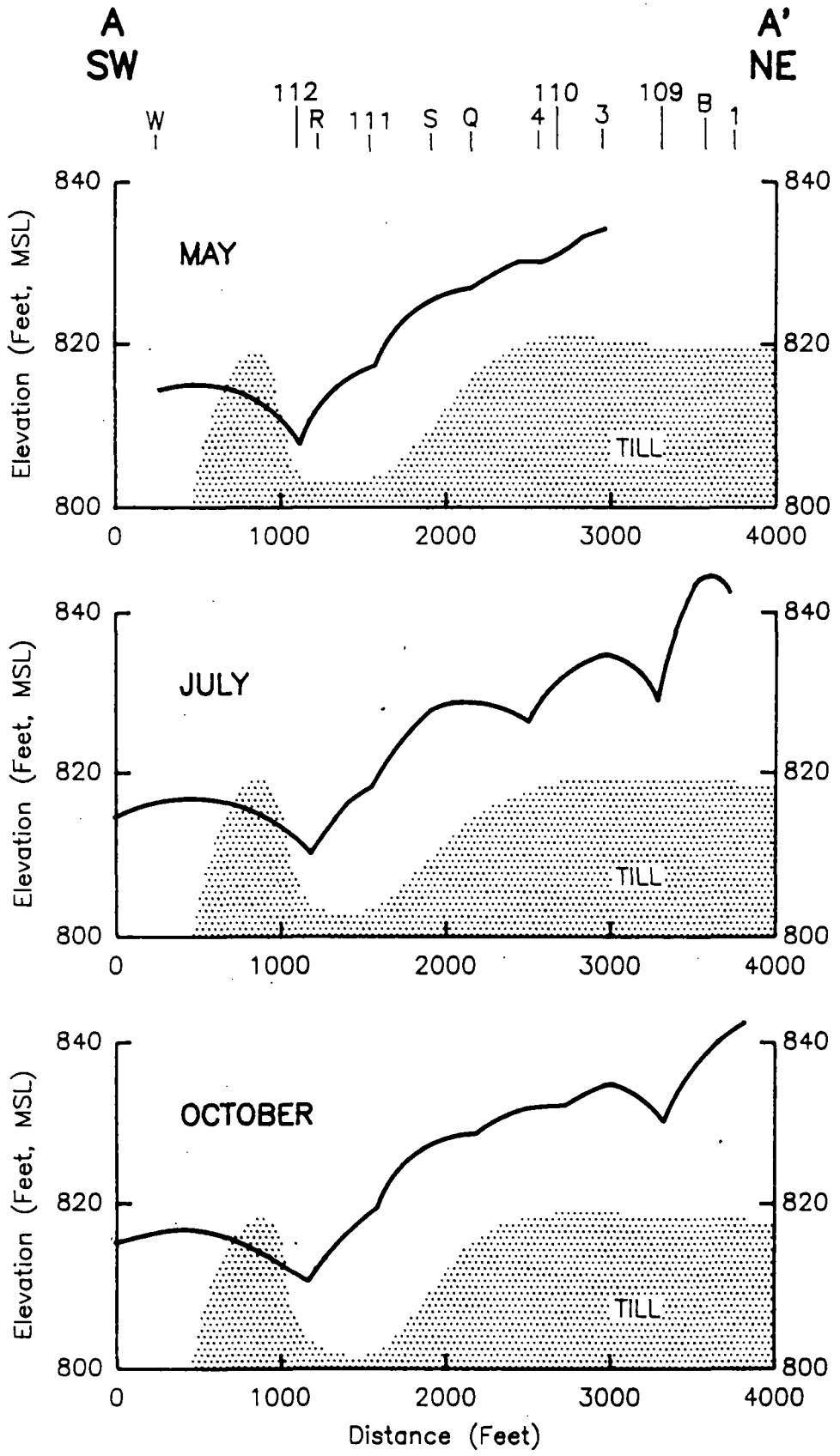
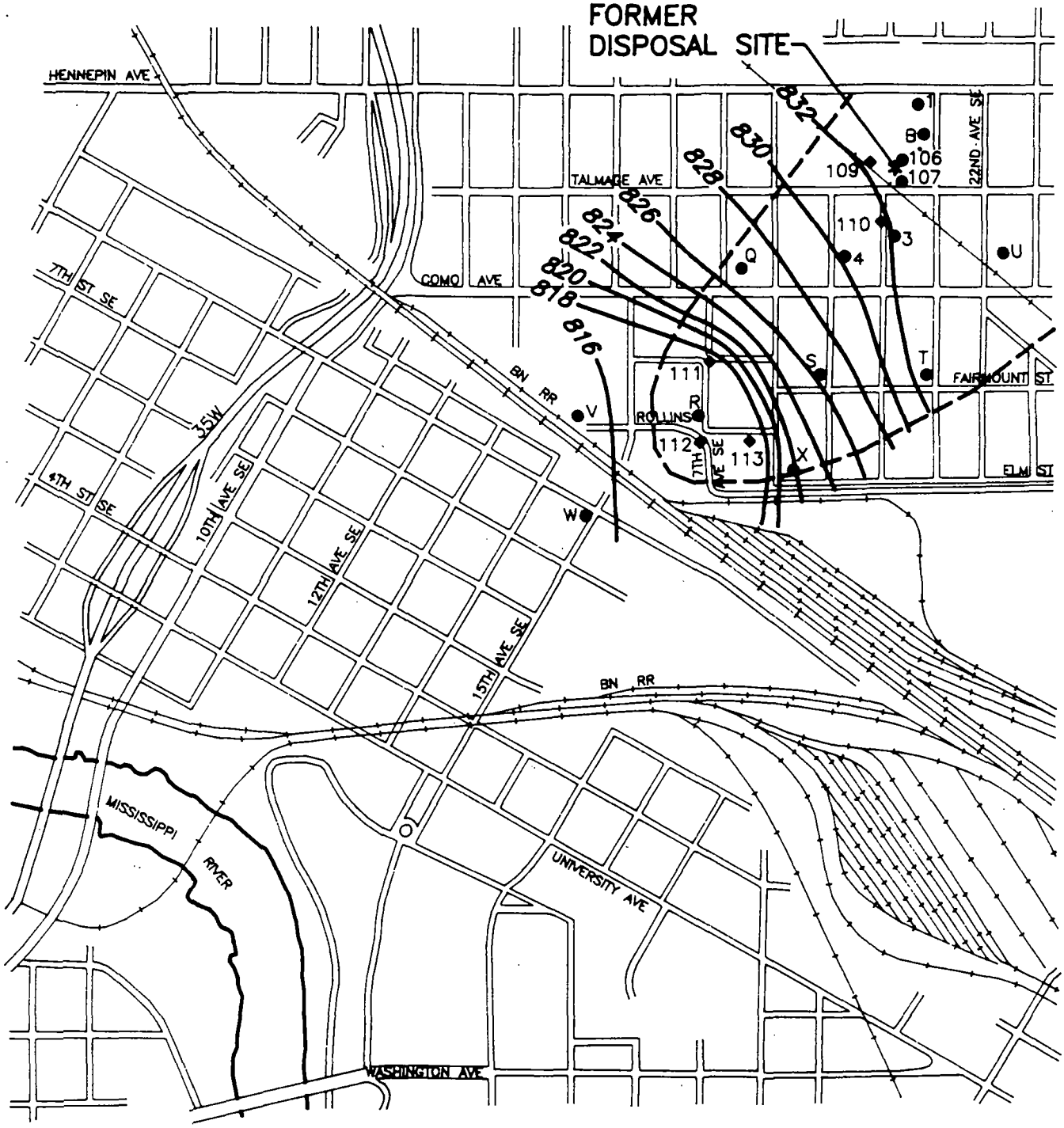


Figure 4

CROSS SECTION A–A'
GLACIAL DRIFT WATER TABLE ELEVATIONS
May, July, October 1990

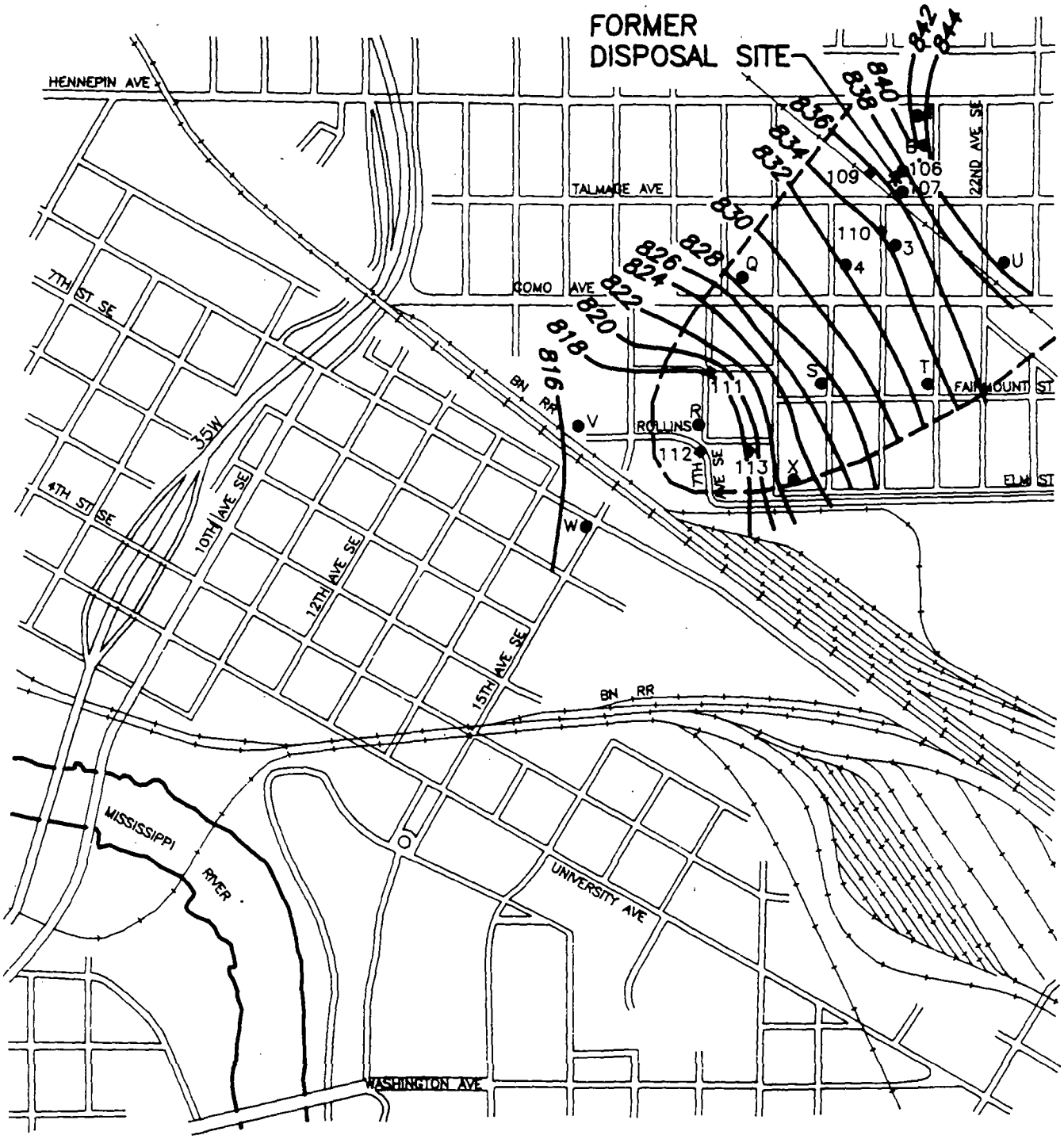


- GLACIAL DRIFT MONITORING WELL
- SITE AND DOWNGRADIENT GLACIAL DRIFT PUMP-OUT WELL
- —822— WATER TABLE CONTOUR (MSL)
- — — — ESTIMATED CAPTURE ZONE

0 1000
SCALE IN FEET

Figure 5

GLACIAL DRIFT AQUIFER
WATER TABLE ELEVATIONS
May 1990



- GLACIAL DRIFT MONITORING WELL
- SITE AND DOWNGRADIENT GLACIAL DRIFT PUMP-OUT WELL

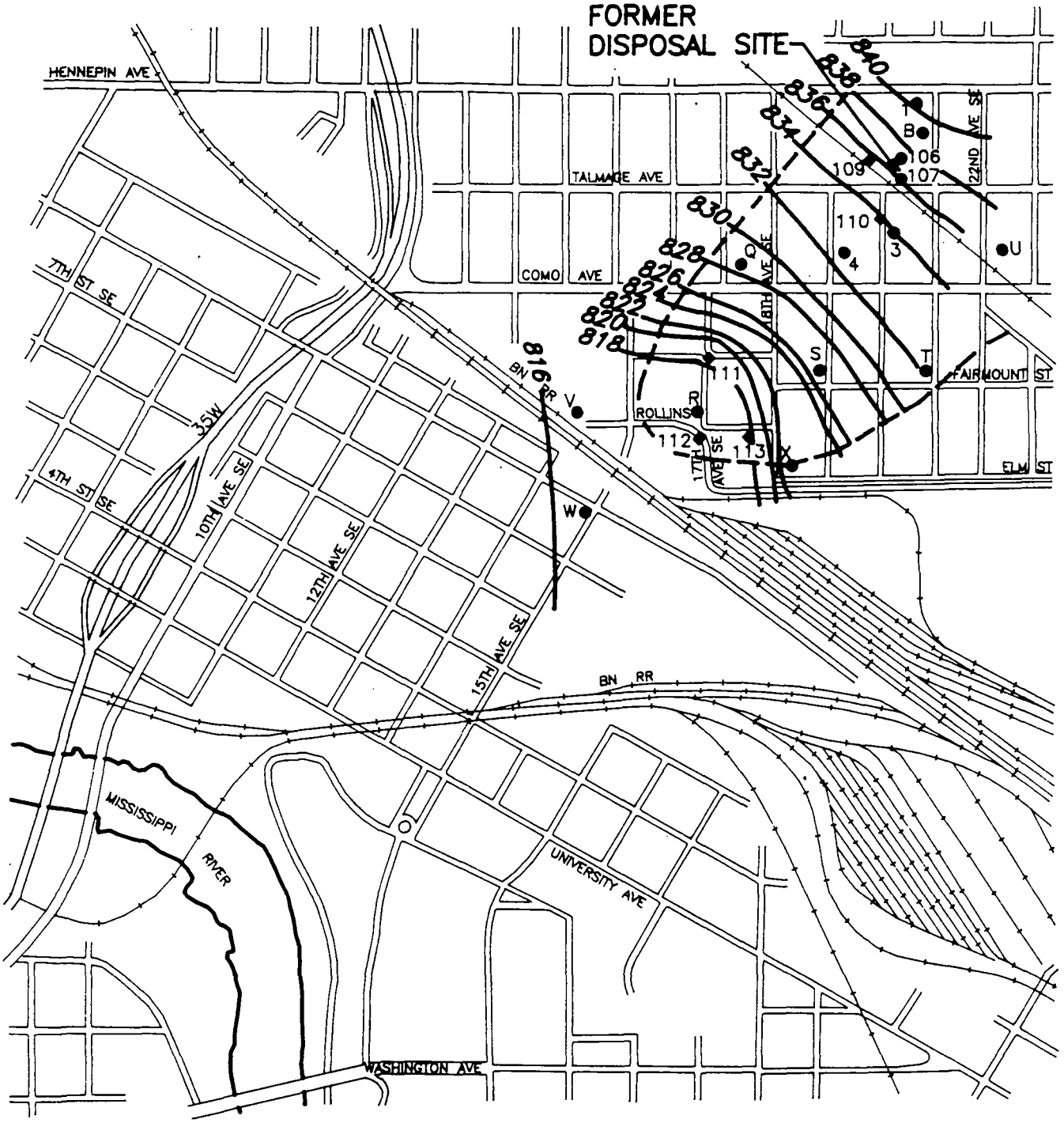
—822— WATER TABLE CONTOUR (MSL)

- - - - ESTIMATED CAPTURE ZONE

0 1000
SCALE IN FEET

Figure 6

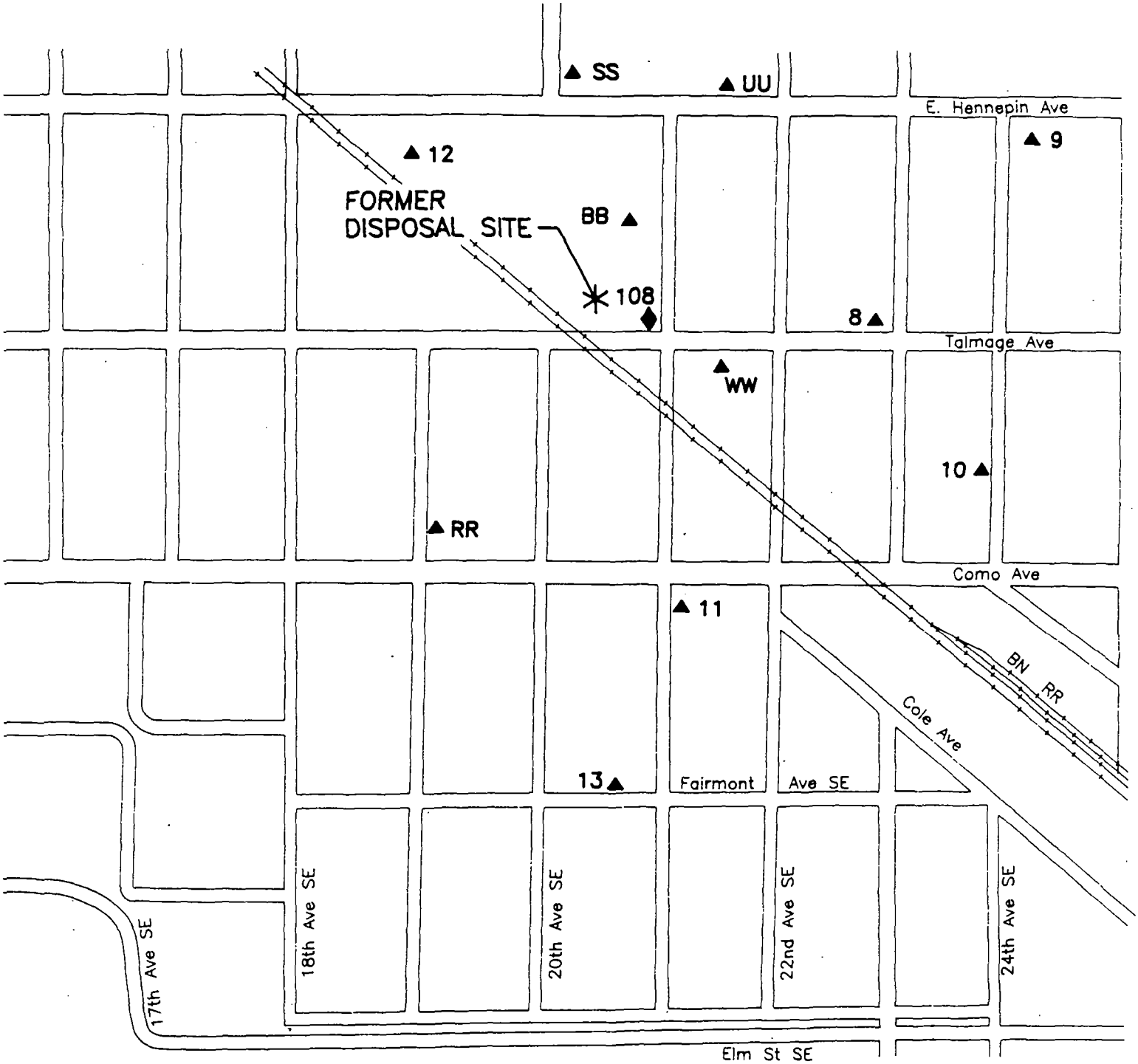
GLACIAL DRIFT AQUIFER
WATER TABLE ELEVATIONS
July 1990



- GLACIAL DRIFT MONITORING WELL
- SITE AND DOWNGRADIENT GLACIAL DRIFT PUMP-OUT WELL
- —822— WATER TABLE CONTOUR (MSL)
- ---- ESTIMATED CAPTURE ZONE

Figure 7

GLACIAL DRIFT AQUIFER
WATER TABLE ELEVATIONS
October 1990



▲ CARIMONA MEMBER MONITORING WELL

◆ CARIMONA MEMBER PUMP-OUT WELL

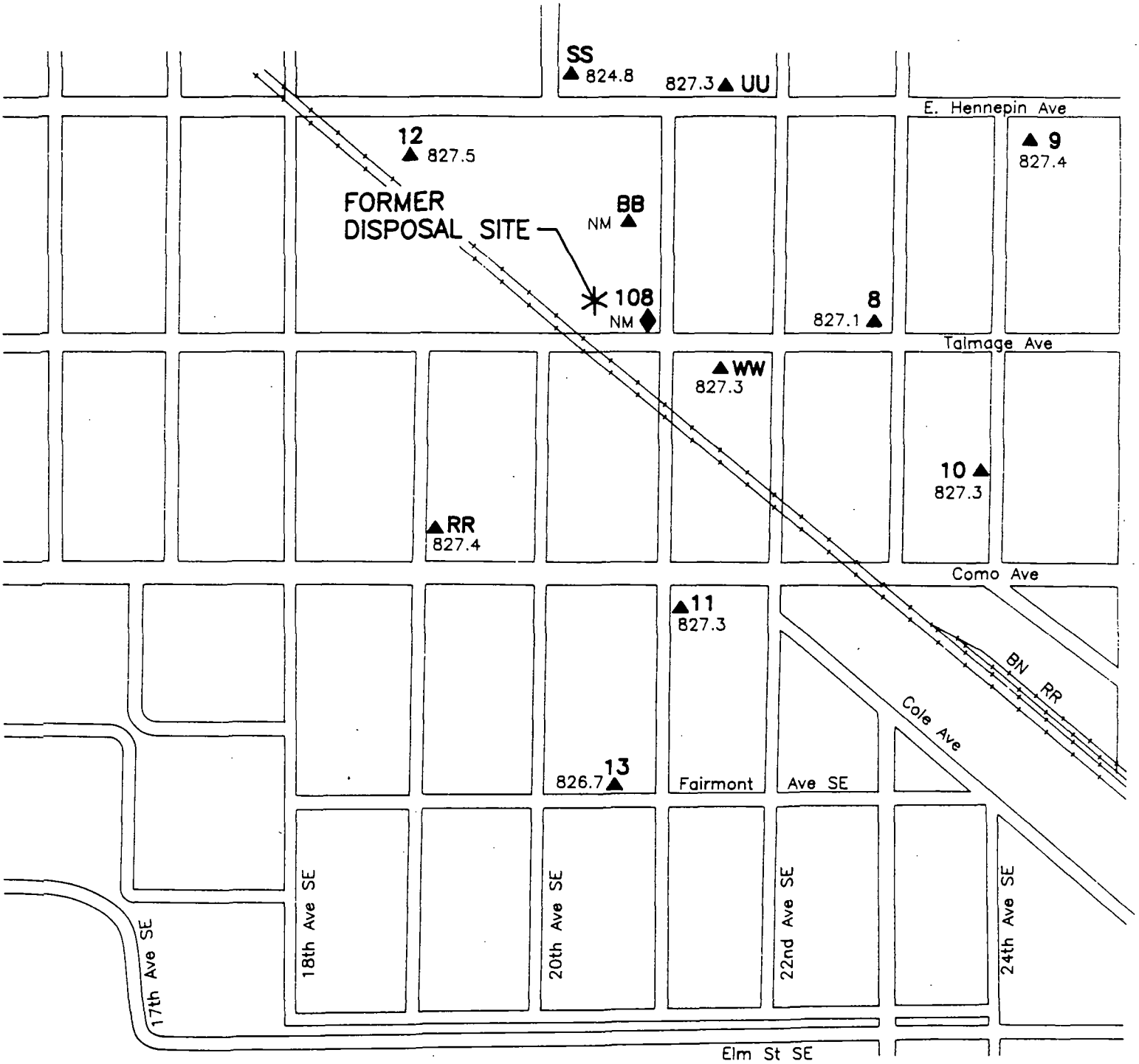
N

0 200 400

SCALE IN FEET

Figure 8

1990 MONITORING LOCATIONS
CARIMONA MEMBER



▲ CARIMONA MEMBER MONITORING WELL

◆ CARIMONA MEMBER PUMP-OUT WELL

826.7 CARIMONA POTENTIOMETRIC SURFACE ELEVATION (MSL)

NM NOT MEASURED

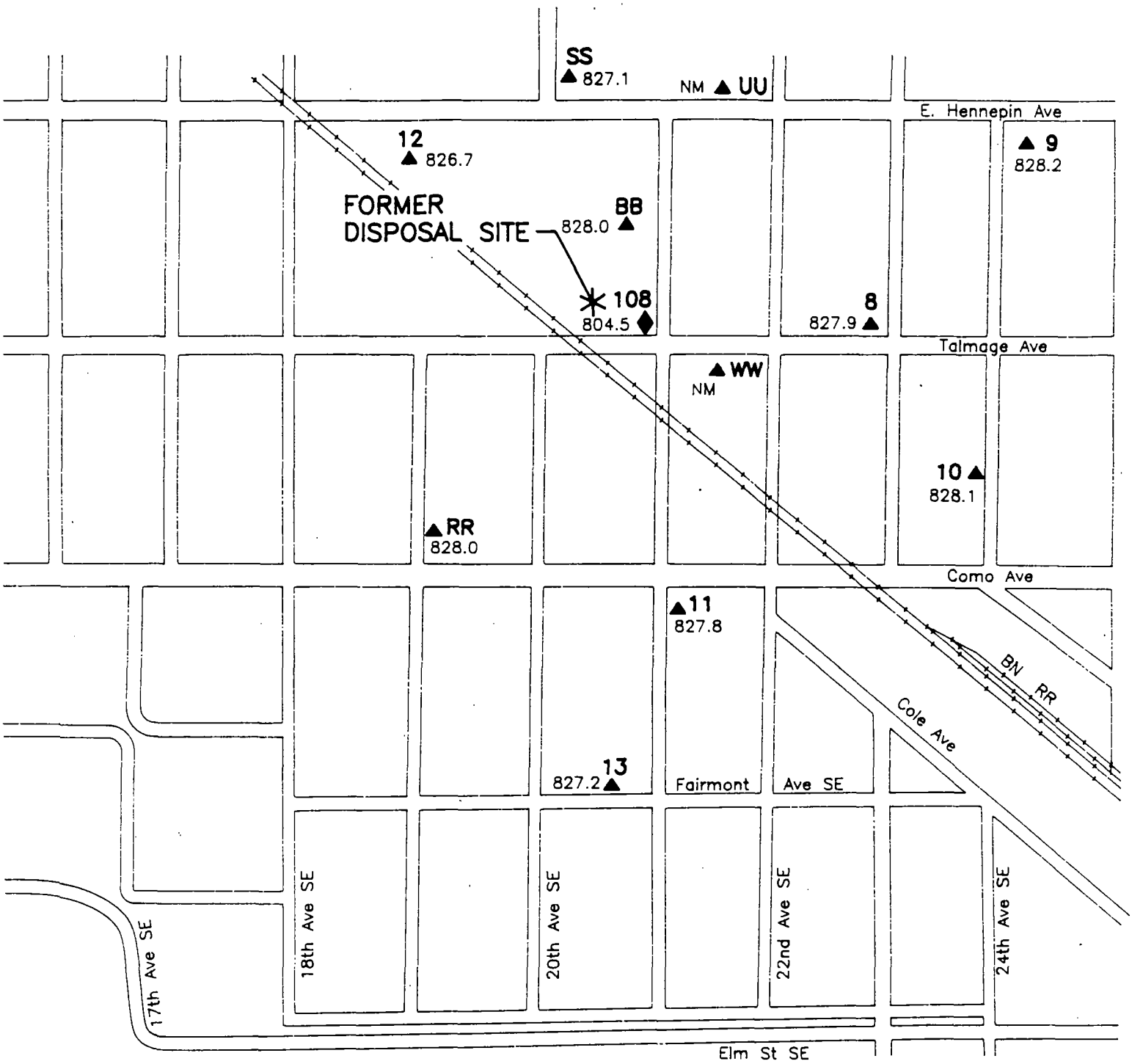
N

0 200 400

SCALE IN FEET

Figure 9

CARIMONA MEMBER
POTENTIOMETRIC SURFACE ELEVATION
May 1990



▲ CARIMONA MEMBER MONITORING WELL

♦ CARIMONA MEMBER PUMP-OUT WELL

827.8 CARIMONA POTENTIOMETRIC SURFACE ELEVATION (MSL)

NM NOT MEASURED

N

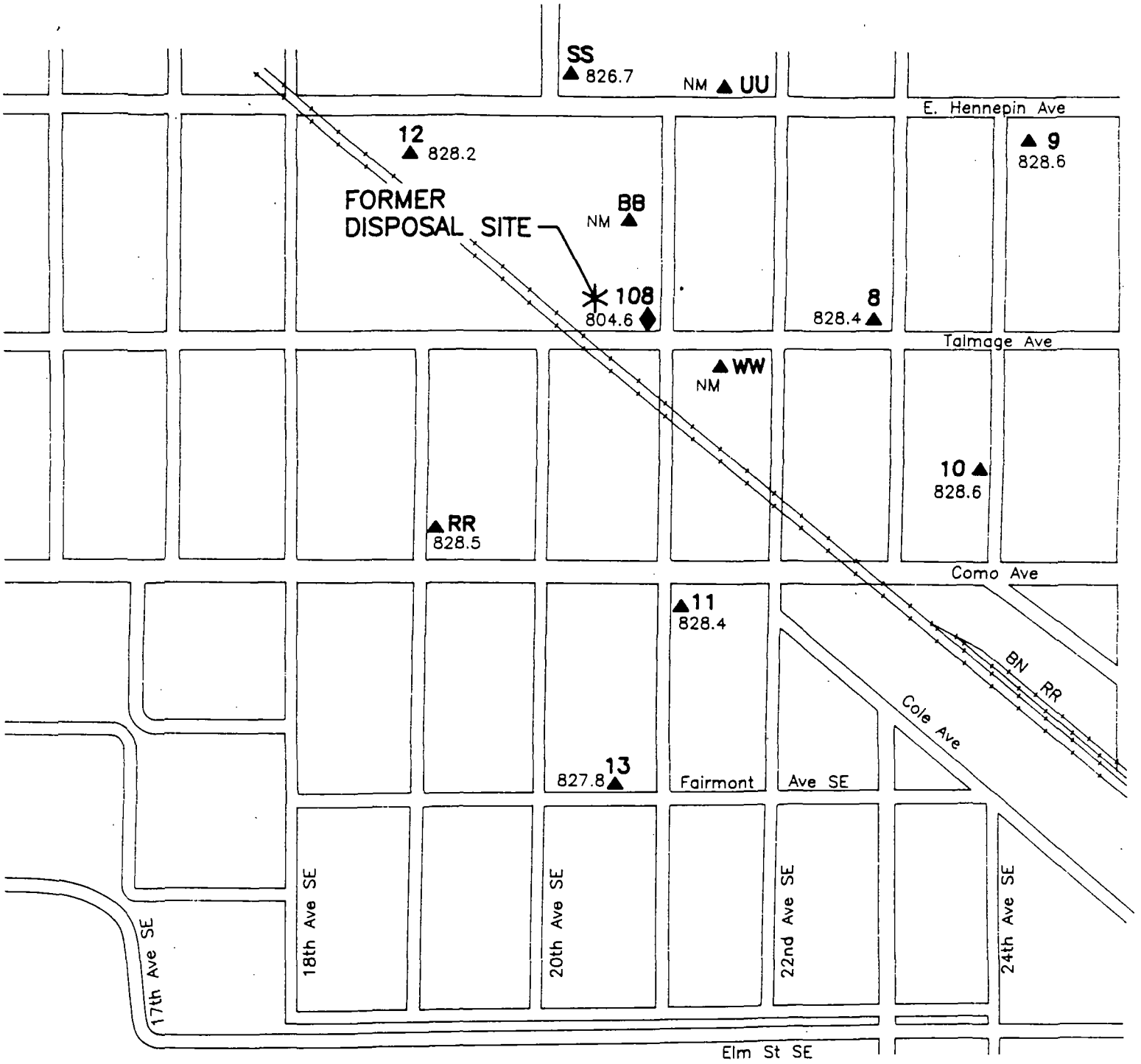
0 200 400

SCALE IN FEET

RJW GM4-F10 1.00 1/03/1991 09:15:57

Figure 10

CARIMONA MEMBER
POTENTIOMETRIC SURFACE ELEVATION
July 1990



▲ CARIMONA MEMBER MONITORING WELL

♦ CARIMONA MEMBER PUMP-OUT WELL

828.4 CARIMONA POTENTIOMETRIC SURFACE ELEVATION (MSL)

NM NOT MEASURED

N

0 200 400

SCALE IN FEET

RJW GMI-F11 1.DG 1/28/1990 13:20:51

Figure 11

CARIMONA MEMBER
POTENTIOMETRIC SURFACE ELEVATION
October 1990

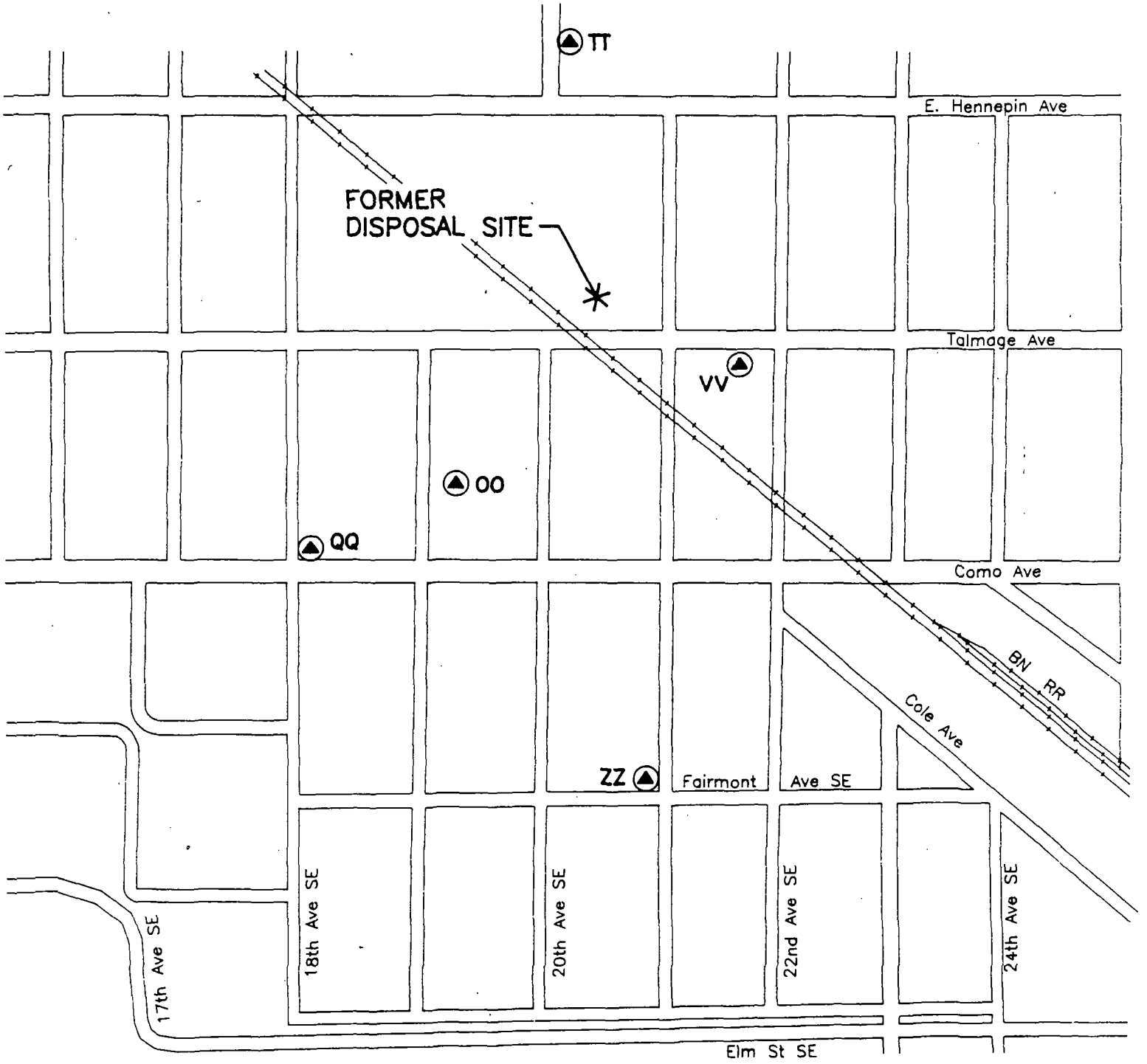
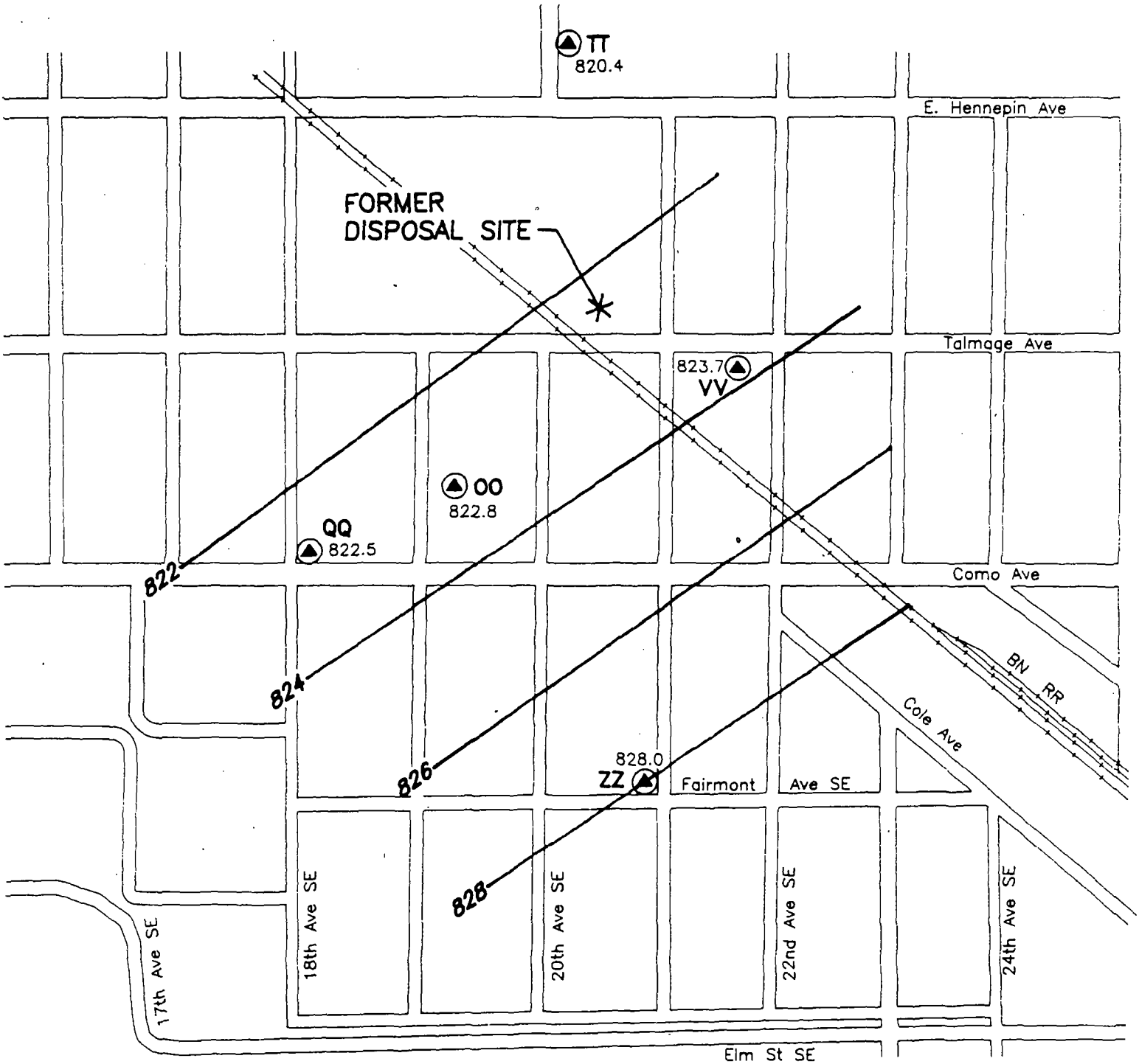


Figure 12

1990 MONITORING LOCATIONS
MAGNOLIA MEMBER



MAGNOLIA MEMBER MONITORING WELL

820.4 MAGNOLIA POTENTIOMETRIC SURFACE ELEVATION (MSL)

MAGNOLIA POTENTIOMETRIC SURFACE CONTOUR (MSL)

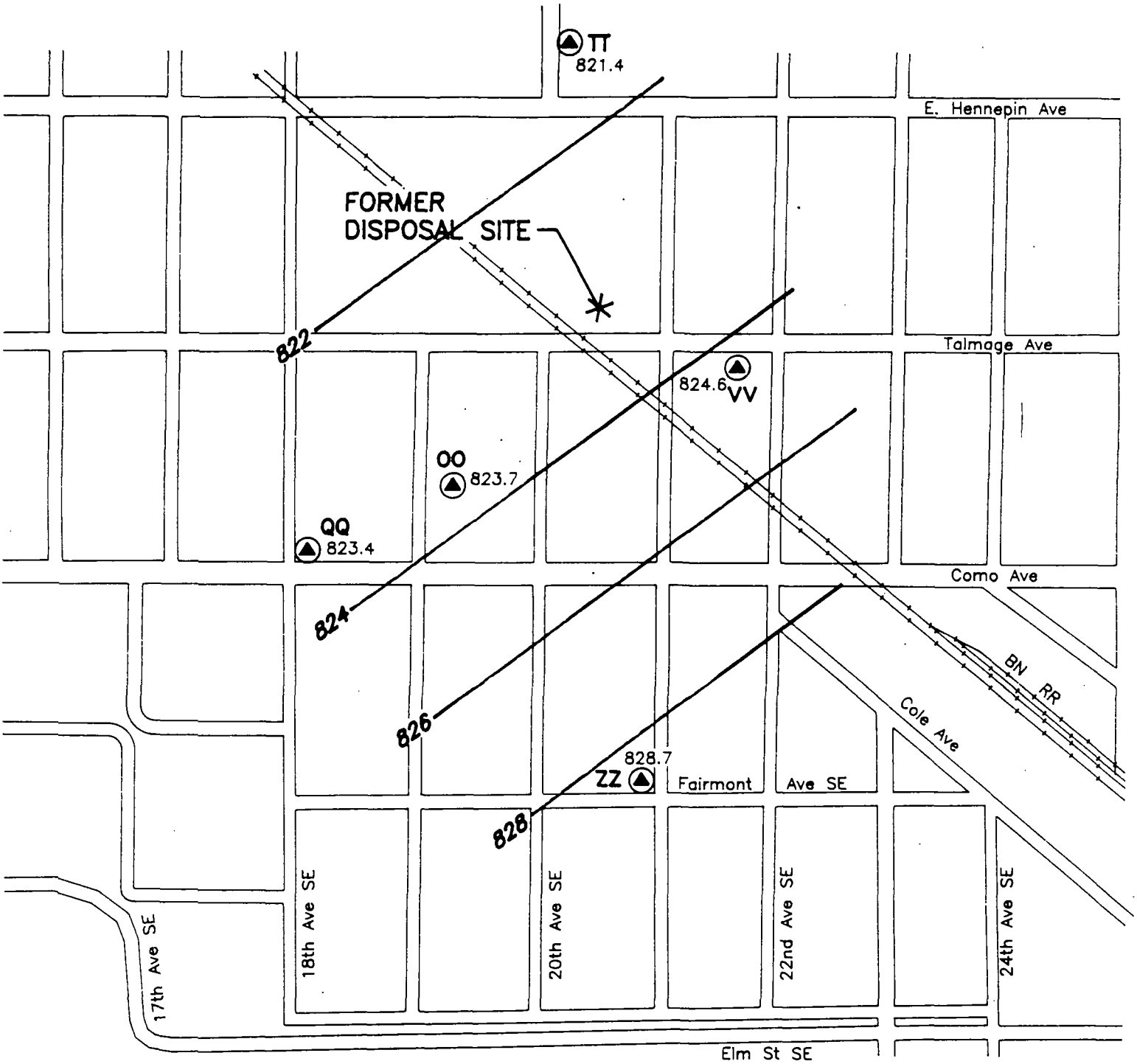
N

0 200 400

SCALE IN FEET

Figure 13

MAGNOLIA MEMBER
POTENTIOMETRIC SURFACE ELEVATION
May 1990



MAGNOLIA MEMBER MONITORING WELL

821.4 MAGNOLIA POTENTIOMETRIC SURFACE ELEVATION (MSL)

MAGNOLIA POTENTIOMETRIC SURFACE CONTOUR (MSL)

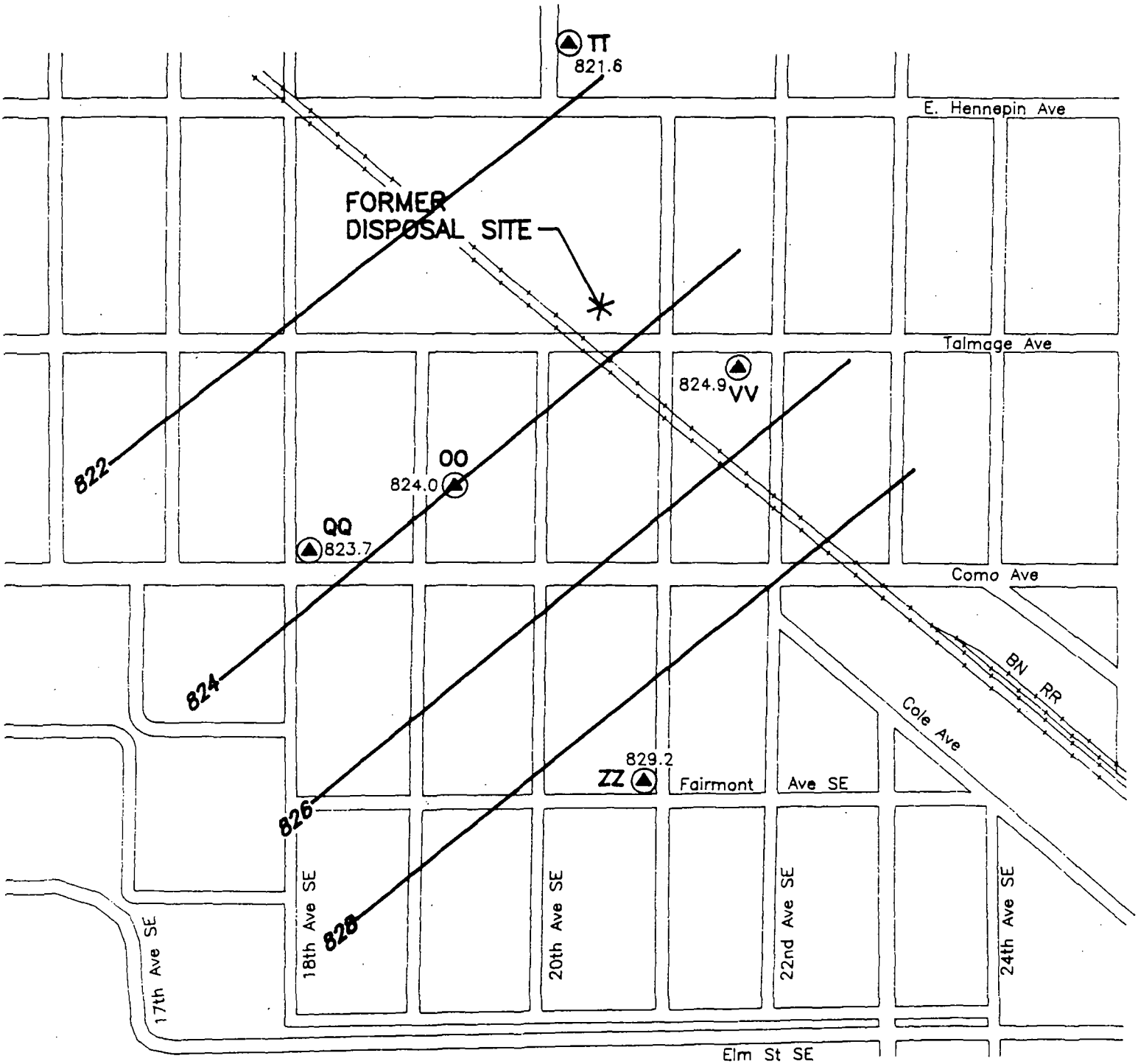
N

0 200 400

SCALE IN FEET

Figure 14

MAGNOLIA MEMBER
POTENTIOMETRIC SURFACE ELEVATION
July 1990



MAGNOLIA MEMBER MONITORING WELL

821.6 MAGNOLIA POTENTIOMETRIC SURFACE ELEVATION (MSL)

MAGNOLIA POTENTIOMETRIC SURFACE CONTOUR (MSL)

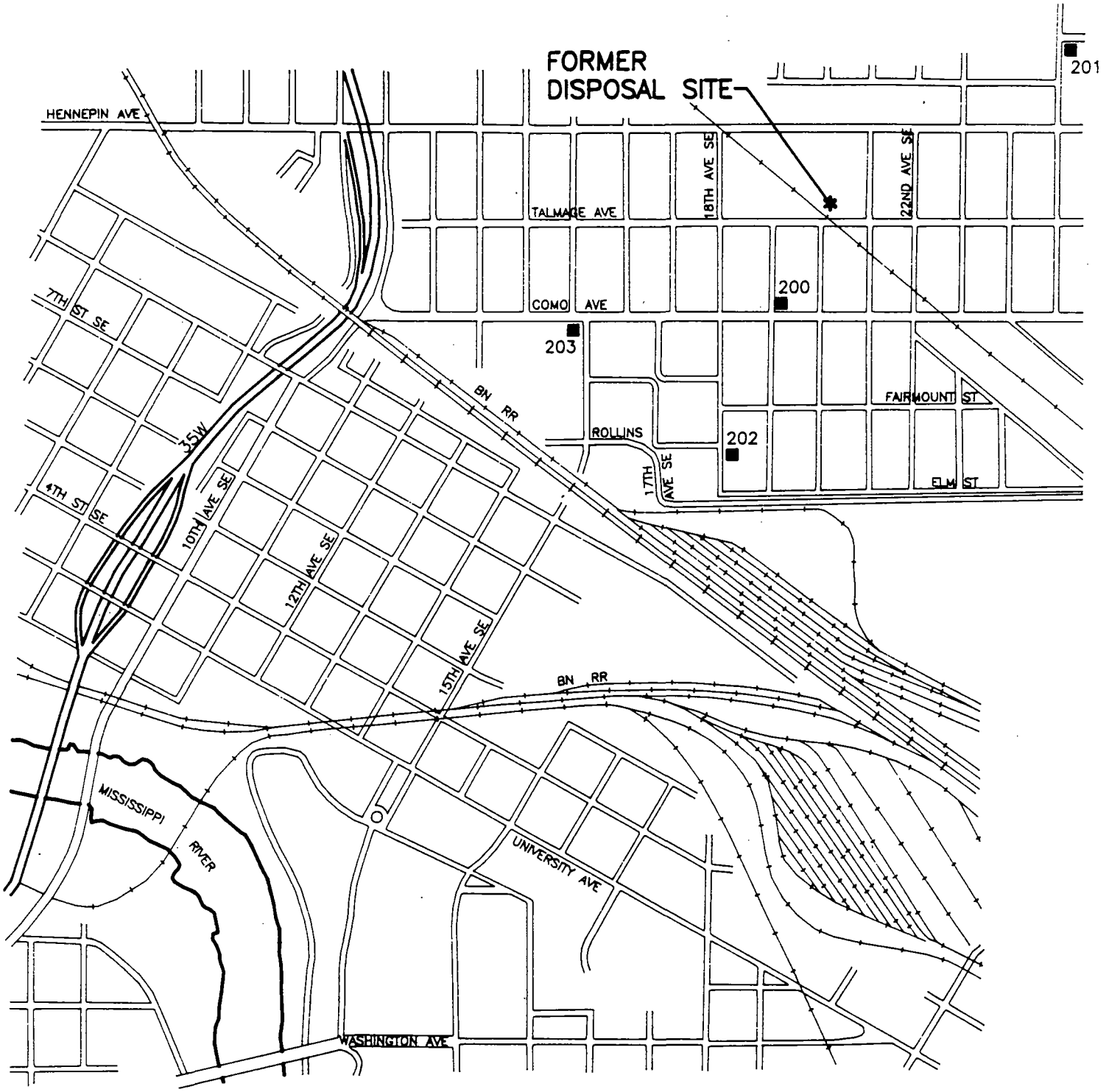
N

0 200 400

SCALE IN FEET

Figure 15

MAGNOLIA MEMBER
POTENTIOMETRIC SURFACE ELEVATION
October 1990

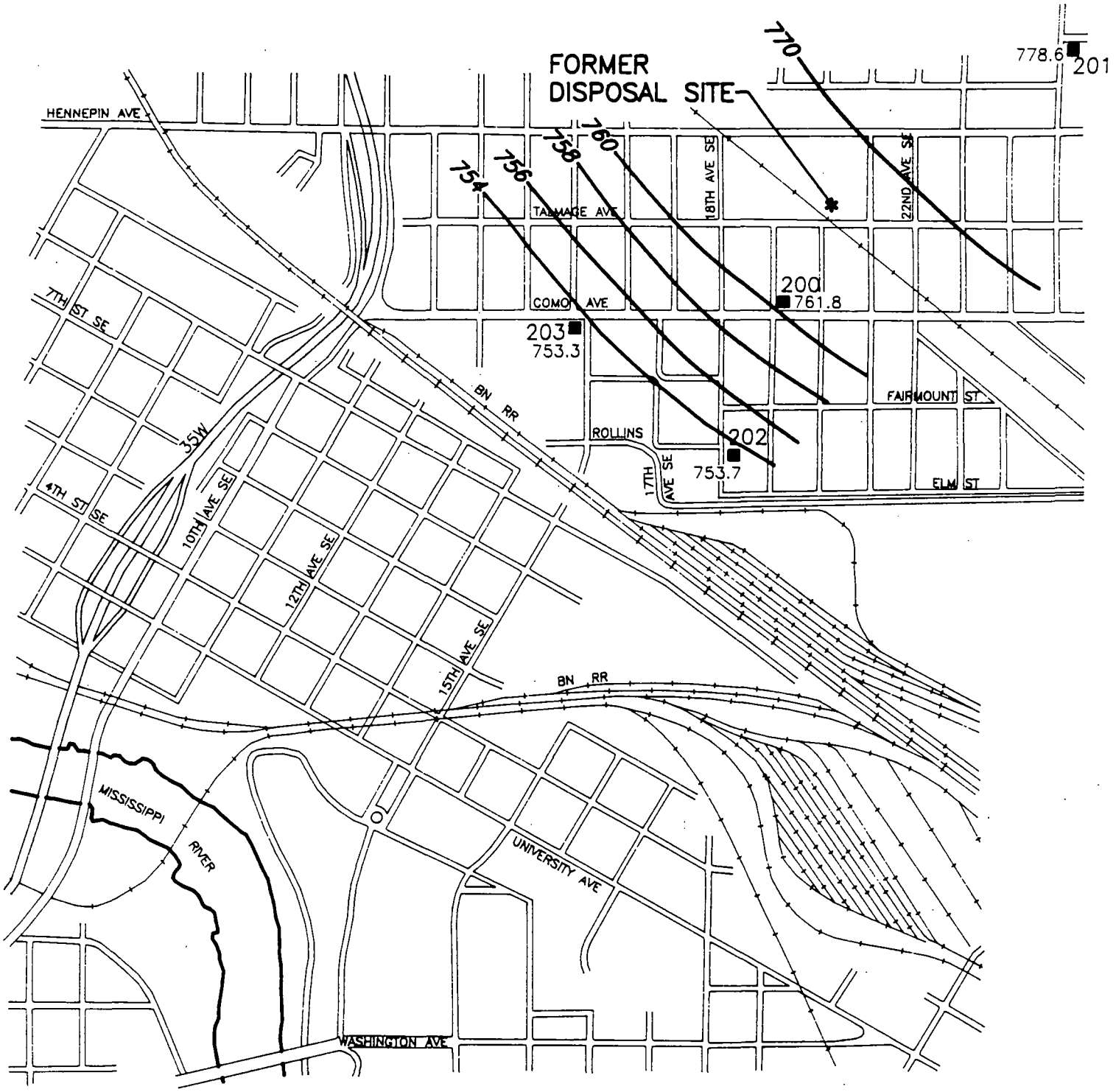


■ ST. PETER MONITORING WELL

RJW GM-F16 1.DL 11/16/1990 15:08:36

Figure 16

1990 MONITORING LOCATIONS
ST. PETER



■ ST. PETER MONITORING WELL

761.8 ST. PETER POTENTIOMETRIC SURFACE ELEVATION (MSL)

—— ST. PETER POTENTIOMETER SURFACE CONTOUR (MSL)

N

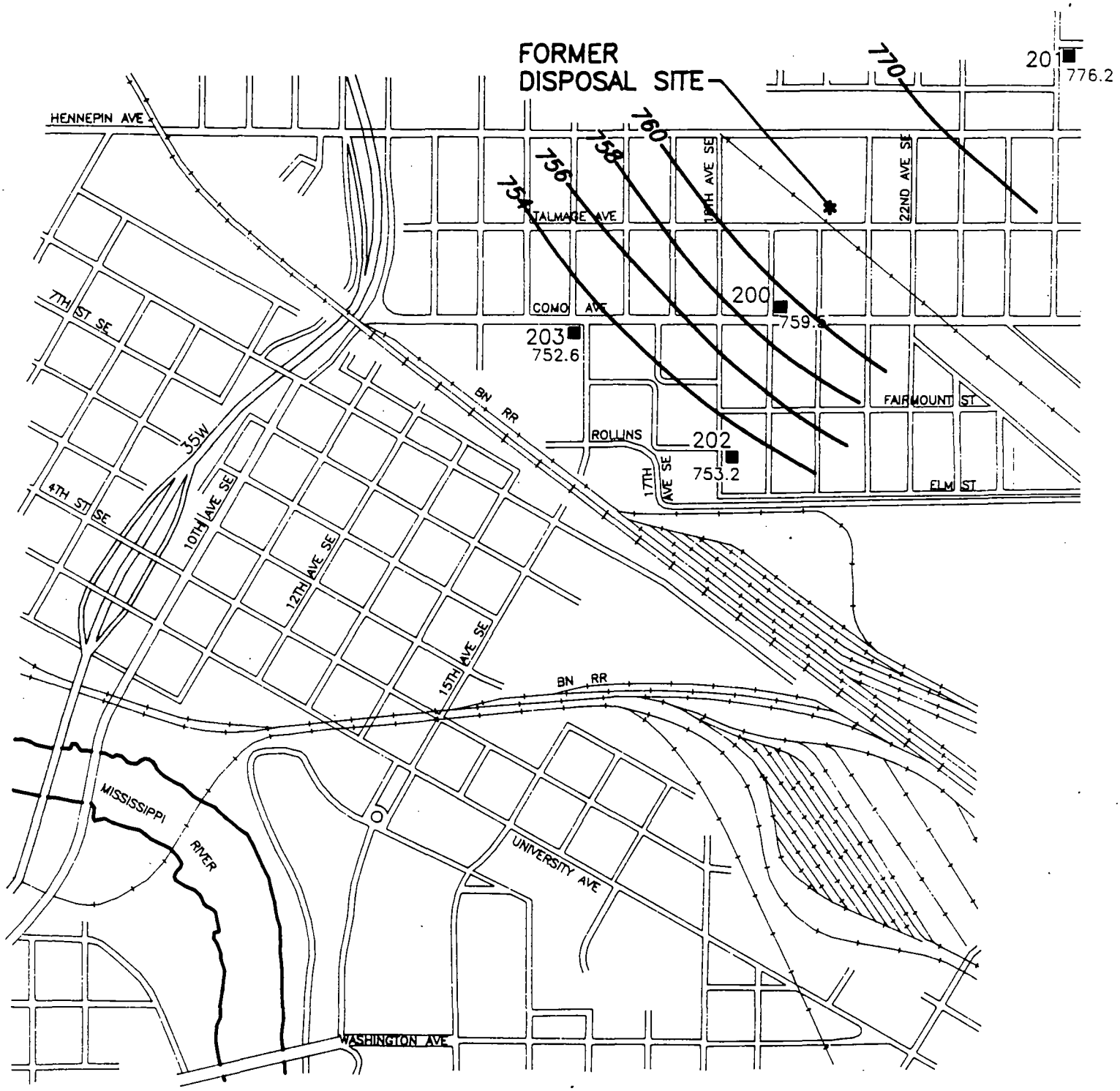
0 1000

SCALE IN FEET

RUW GWI-F17 1.00 J1/03/1991 08:58:30

Figure 17

ST. PETER
POTENTIOMETRIC SURFACE ELEVATION
May 1990



■ ST. PETER MONITORING WELL

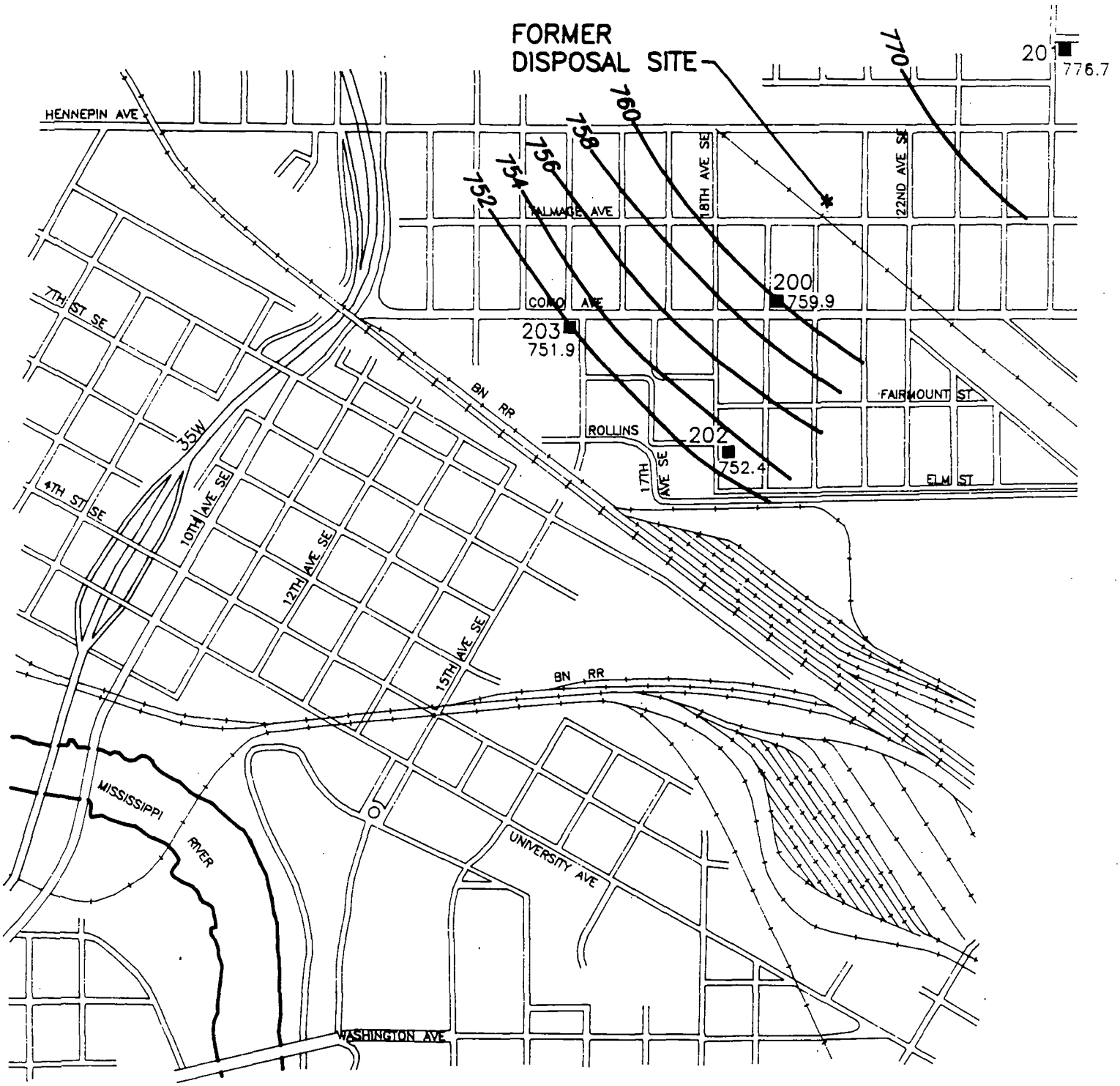
759.5 ST. PETER POTENTIOMETRIC SURFACE ELEVATION (MSL)

—— ST. PETER POTENTIOMETRIC SURFACE CONTOUR (MSL)

RJW gml-f18 1.00 J1/03/1991 08:47:12

Figure 18

ST. PETER
POTENTIOMETRIC SURFACE ELEVATION
July 1990



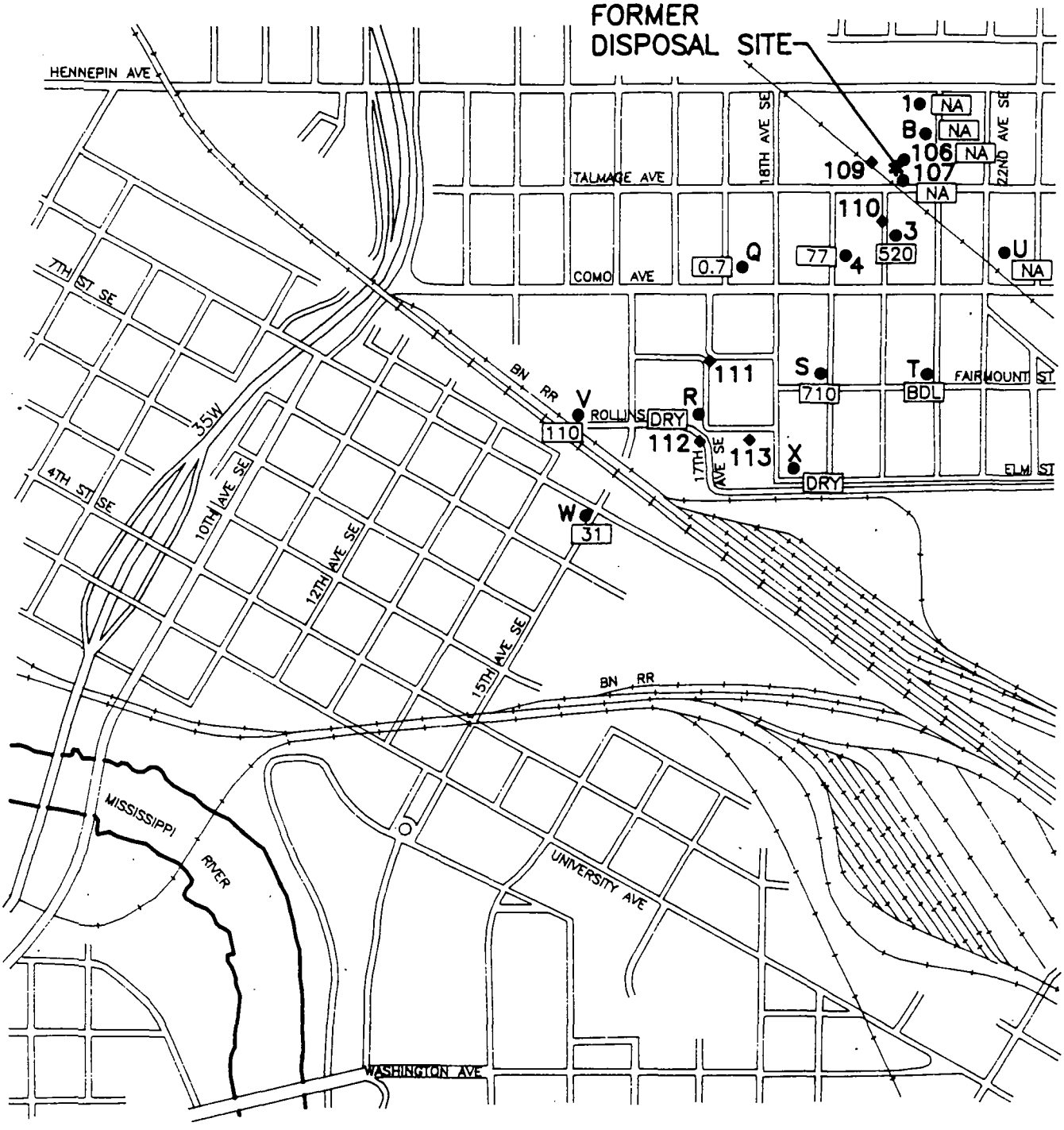
■ ST. PETER MONITORING WELL

759.9 ST. PETER POTENTIOMETRIC SURFACE ELEVATION (MSL)

—— ST. PETER POTENTIOMETRIC SURFACE CONTOUR (MSL)

Figure 19

ST. PETER
POTENTIOMETRIC SURFACE ELEVATION
October 1990

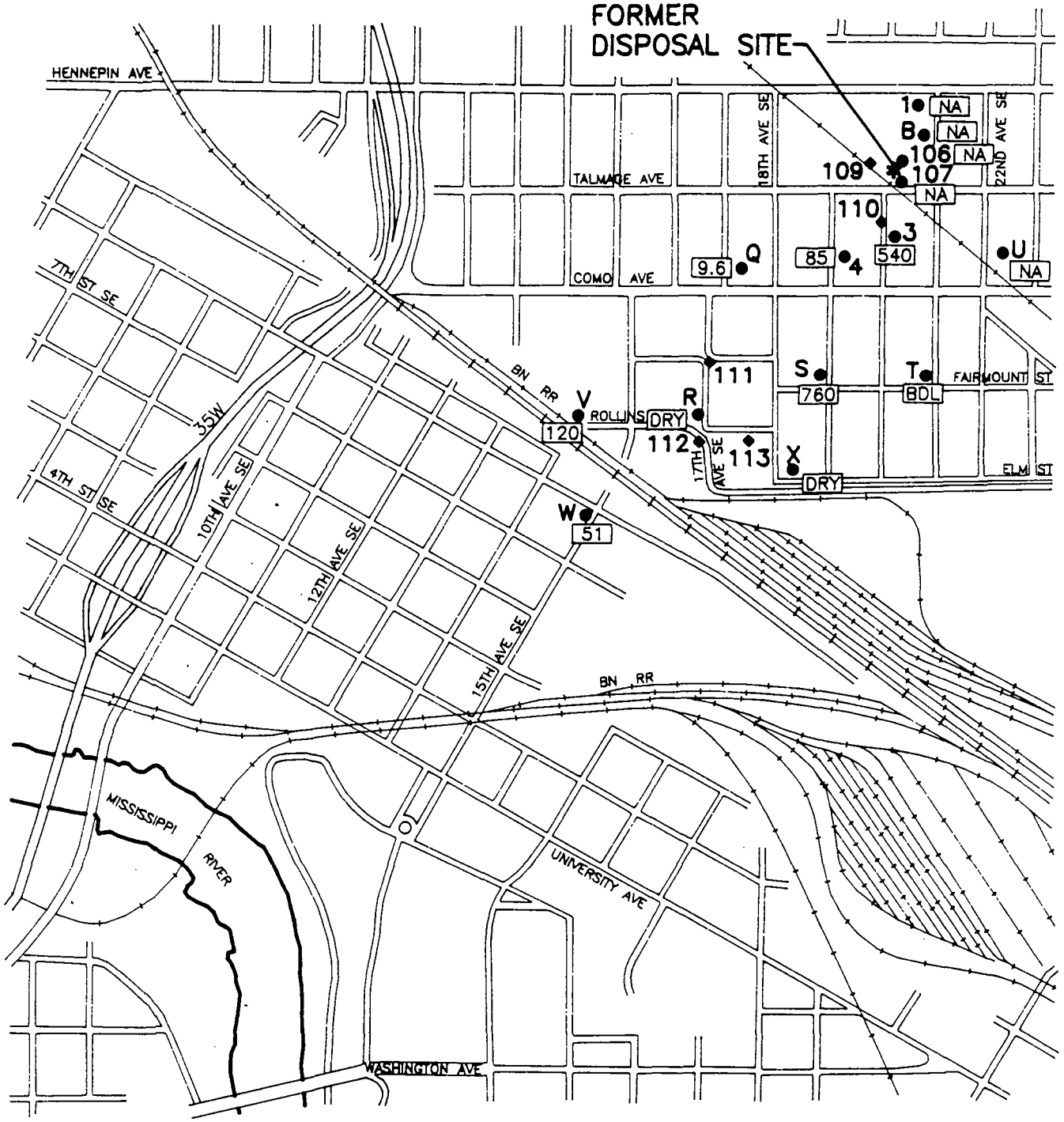


- ● GLACIAL DRIFT MONITORING WELL
- ◆ SITE AND DOWNGRADIENT GLACIAL DRIFT PUMP-OUT WELL
- [110] TRICHLOROETHENE CONCENTRATION (ug/L) (TCE)
- [BDL] BELOW DETECTION LIMIT
- [NA] NOT ANALYZED

N

0 1000
SCALE IN FEET

Figure 20
GLACIAL DRIFT AQUIFER
WATER QUALITY (TCE)
May 1990

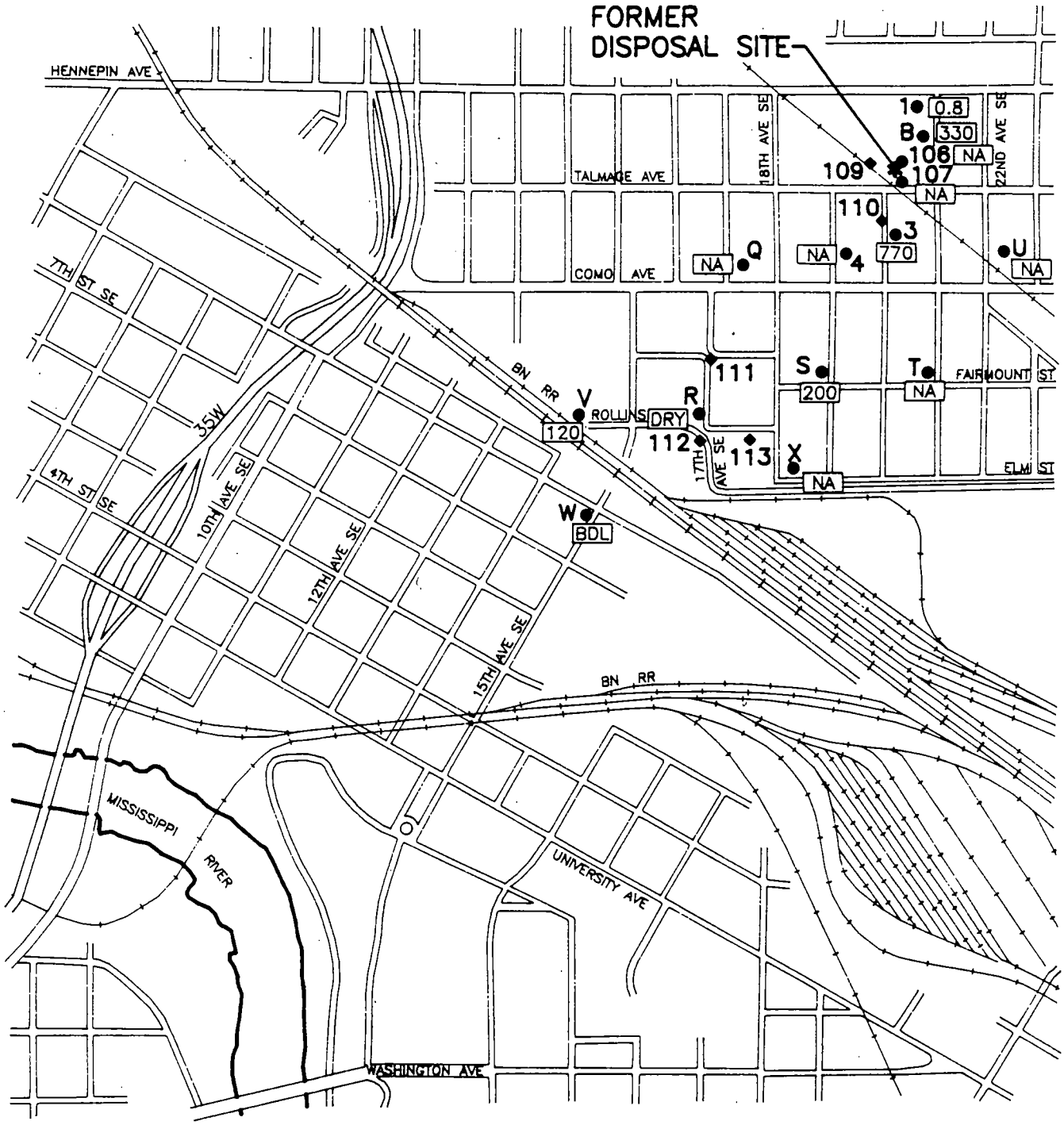


- ● GLACIAL DRIFT MONITORING WELL
- ◆ SITE AND DOWNGRADIENT GLACIAL DRIFT PUMP-OUT WELL
- 540 SUM OF VOLATILE ORGANIC CONCENTRATIONS (ug/L) (VOC)
- BDL BELOW DETECTION LIMIT
- NA NOT ANALYZED

N

0 1000
SCALE IN FEET

Figure 21
GLACIAL DRIFT AQUIFER
WATER QUALITY (VOC)
May 1990



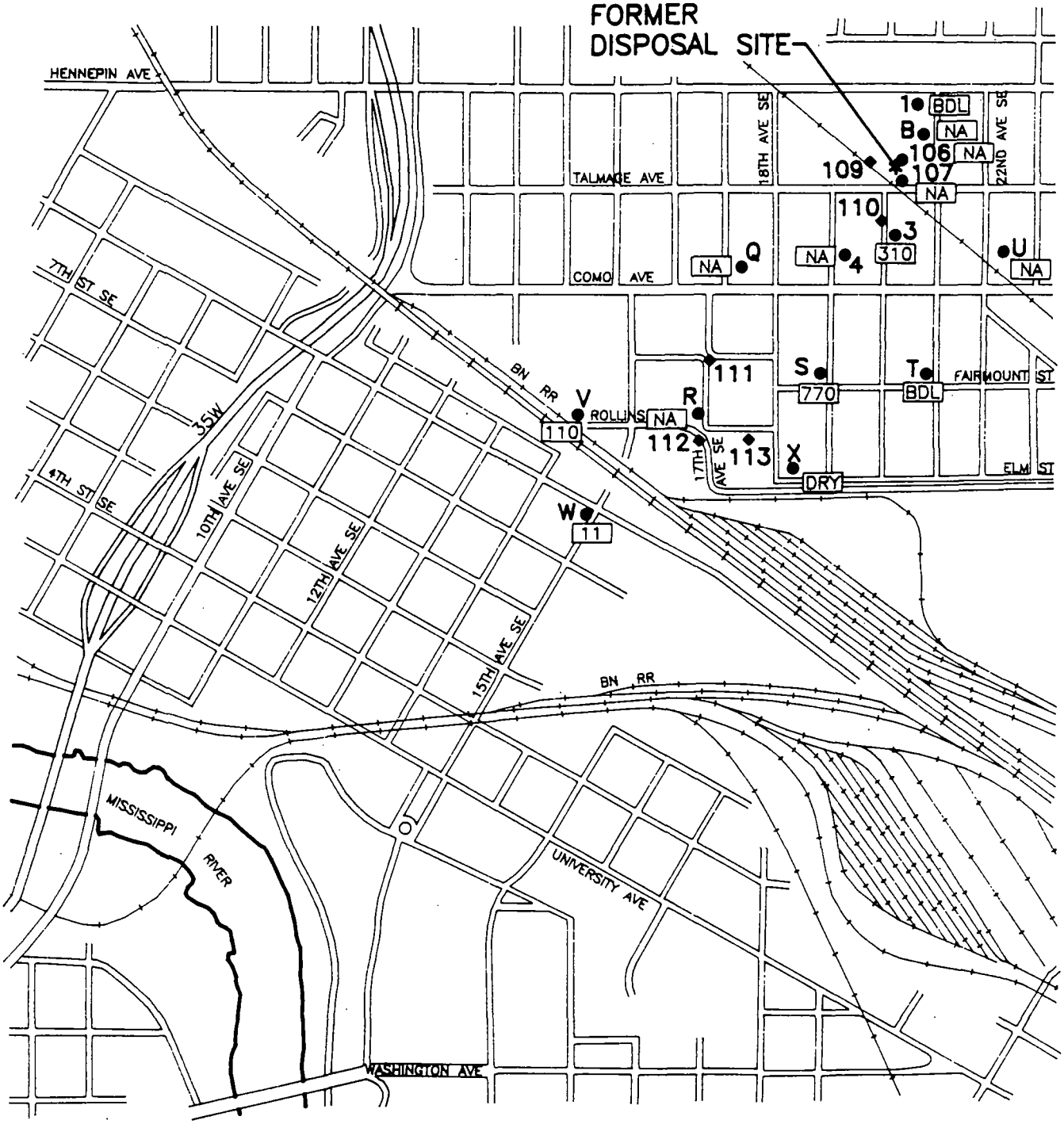
- ● GLACIAL DRIFT MONITORING WELL
- ◆ SITE AND DOWNGRADIENT GLACIAL DRIFT PUMP-OUT WELL
- 770 TRICHLOROETHENE CONCENTRATION (ug/L) (TCE)
- BDL BELOW DETECTION LIMIT
- NA NOT ANALYZED

N

0 1000
SCALE IN FEET

Figure 22

GLACIAL DRIFT AQUIFER
WATER QUALITY (TCE)
July 1990



- GLACIAL DRIFT MONITORING WELL
- SITE AND DOWNGRADIENT GLACIAL DRIFT PUMP-OUT WELL
- [530] TRICHLOROETHENE CONCENTRATION (ug/L) (TCE)
- [BDL] BELOW DETECTION LIMIT
- [NA] NOT ANALYZED

N

0 1000
SCALE IN FEET

Figure 23
GLACIAL DRIFT AQUIFER
WATER QUALITY (TCE)
October 1990

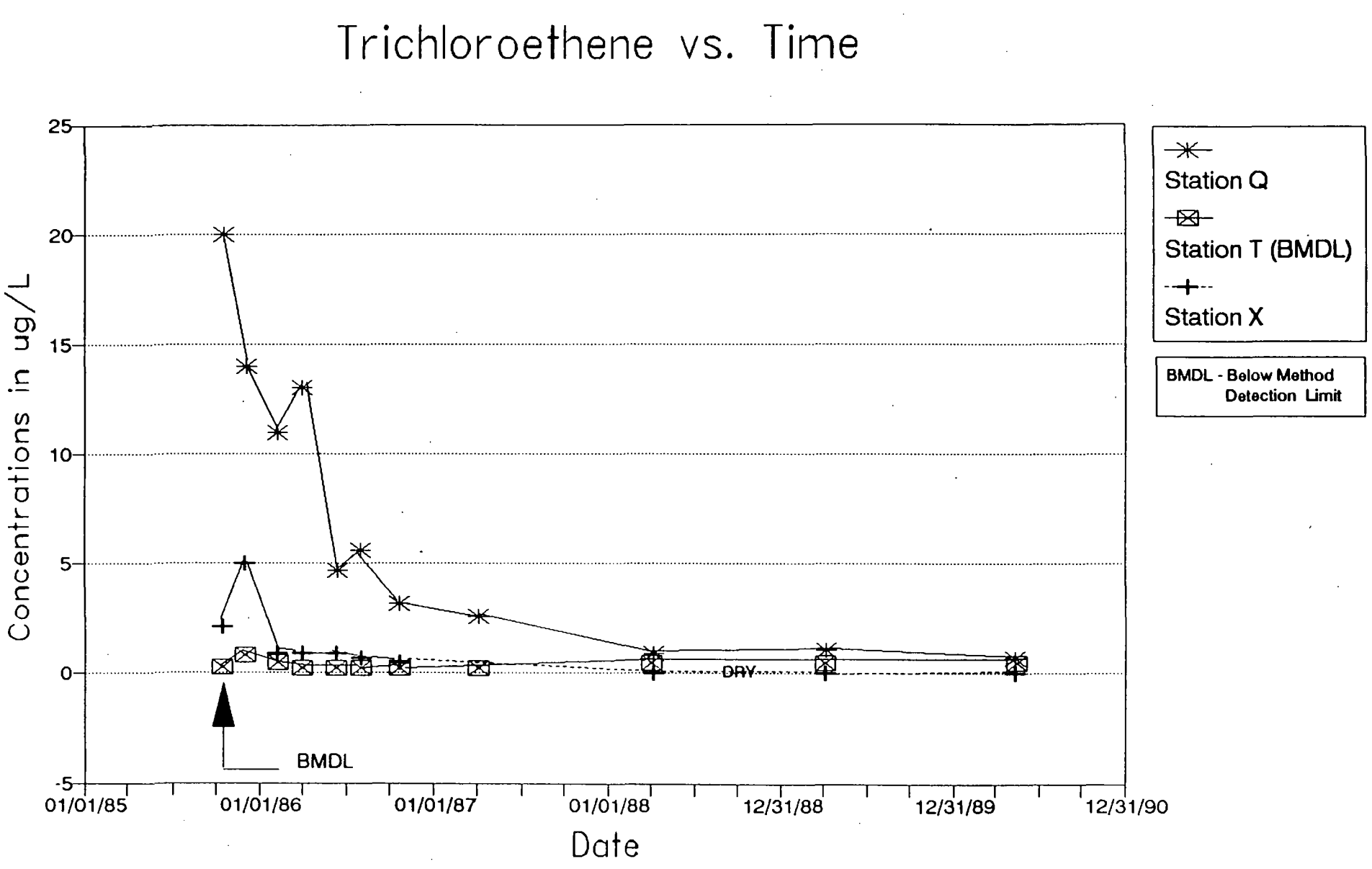


Figure 24

GLACIAL DRIFT WELLS
TCE CONCENTRATION
1985 - 1990

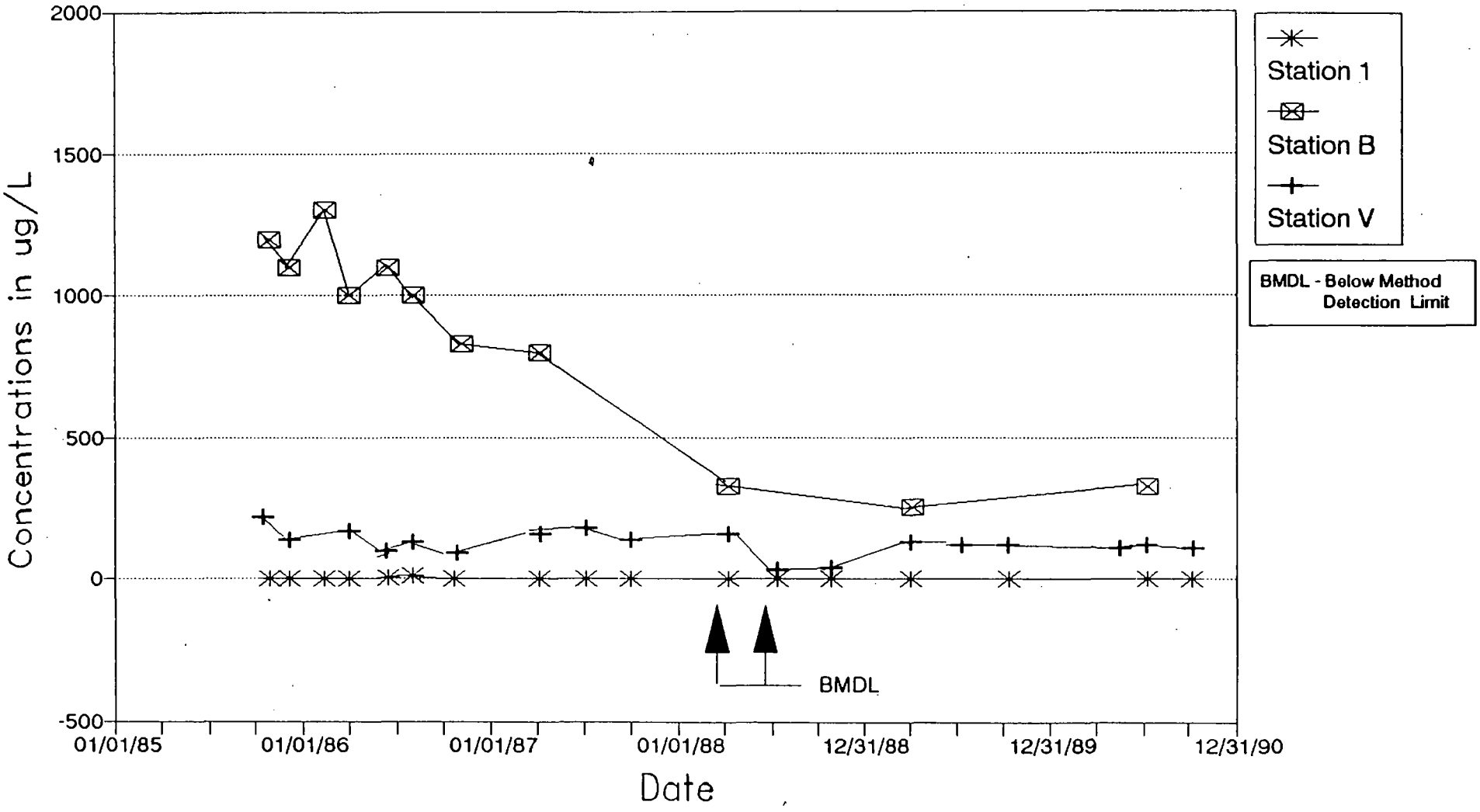


Figure 24 (cont.)

GLACIAL DRIFT WELLS
TCE CONCENTRATION
1985 - 1990

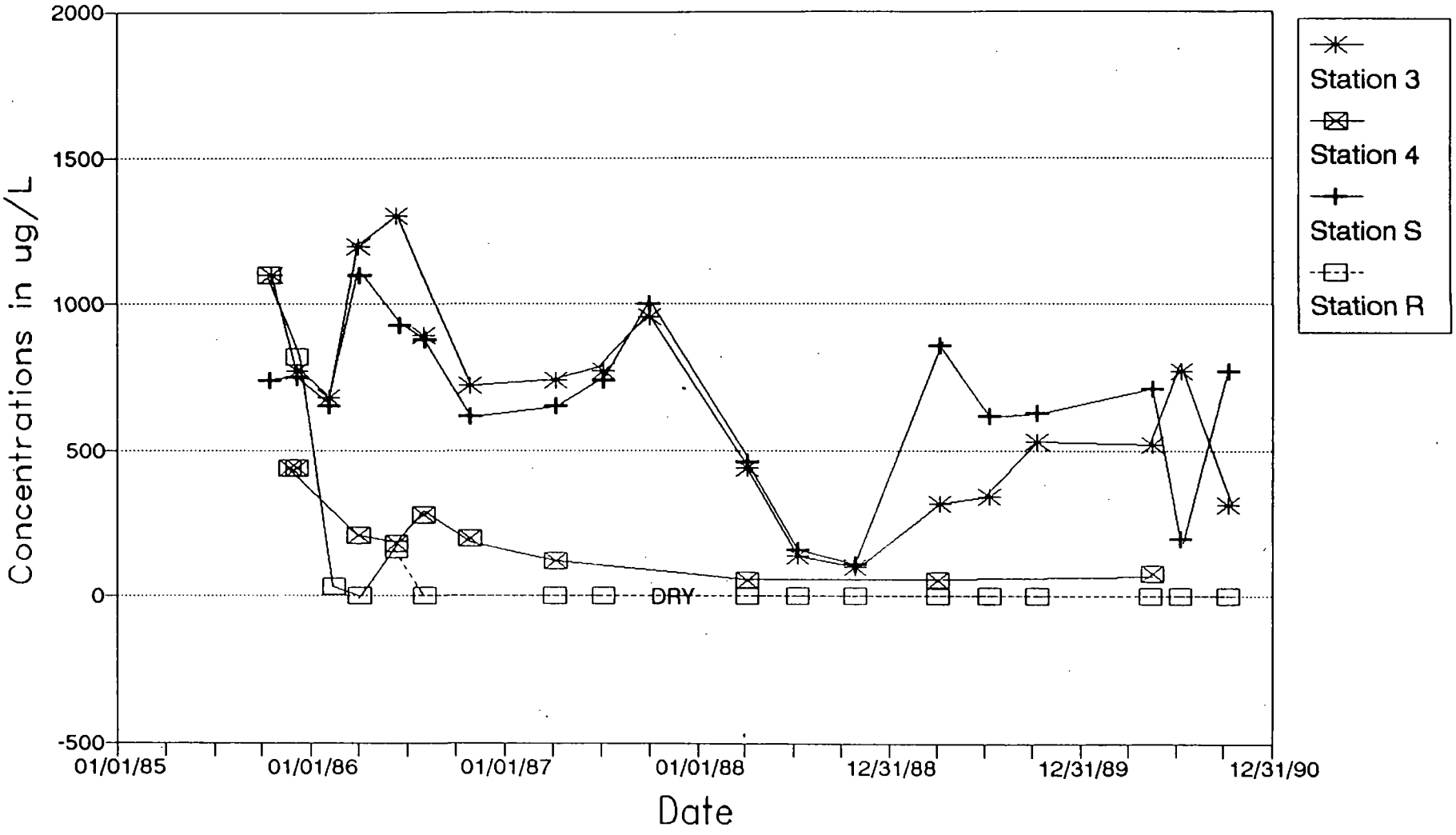
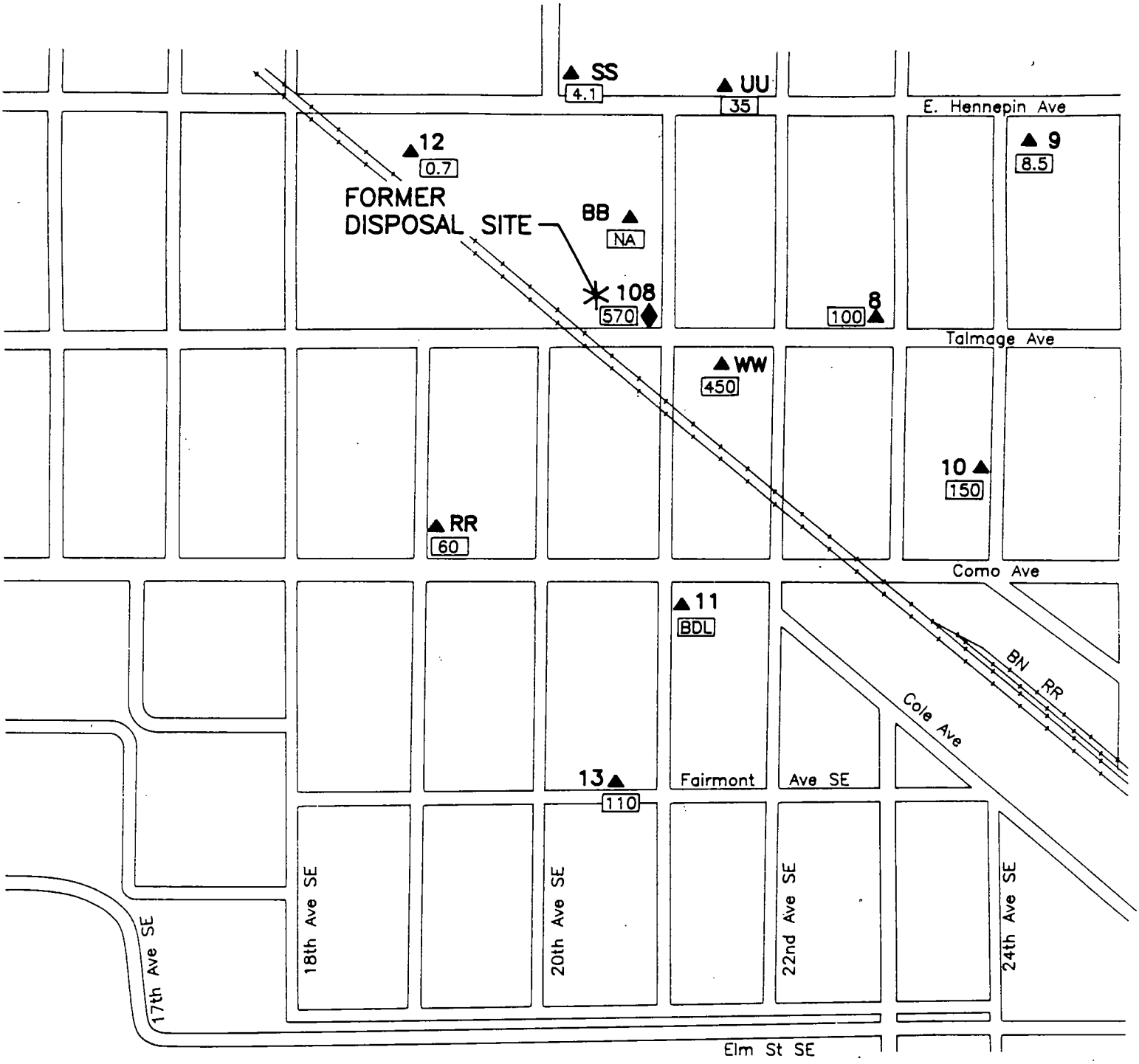


Figure 24 (cont.)

GLACIAL DRIFT WELLS
TCE CONCENTRATION
1985 - 1990



▲ CARIMONA MEMBER MONITORING WELL

◆ CARIMONA MEMBER PUMP-OUT WELL

570 TRICHLOROETHENE CONCENTRATION (ug/L) (TCE)

BDL BELOW DETECTION LIMIT

NA NOT ANALYZED

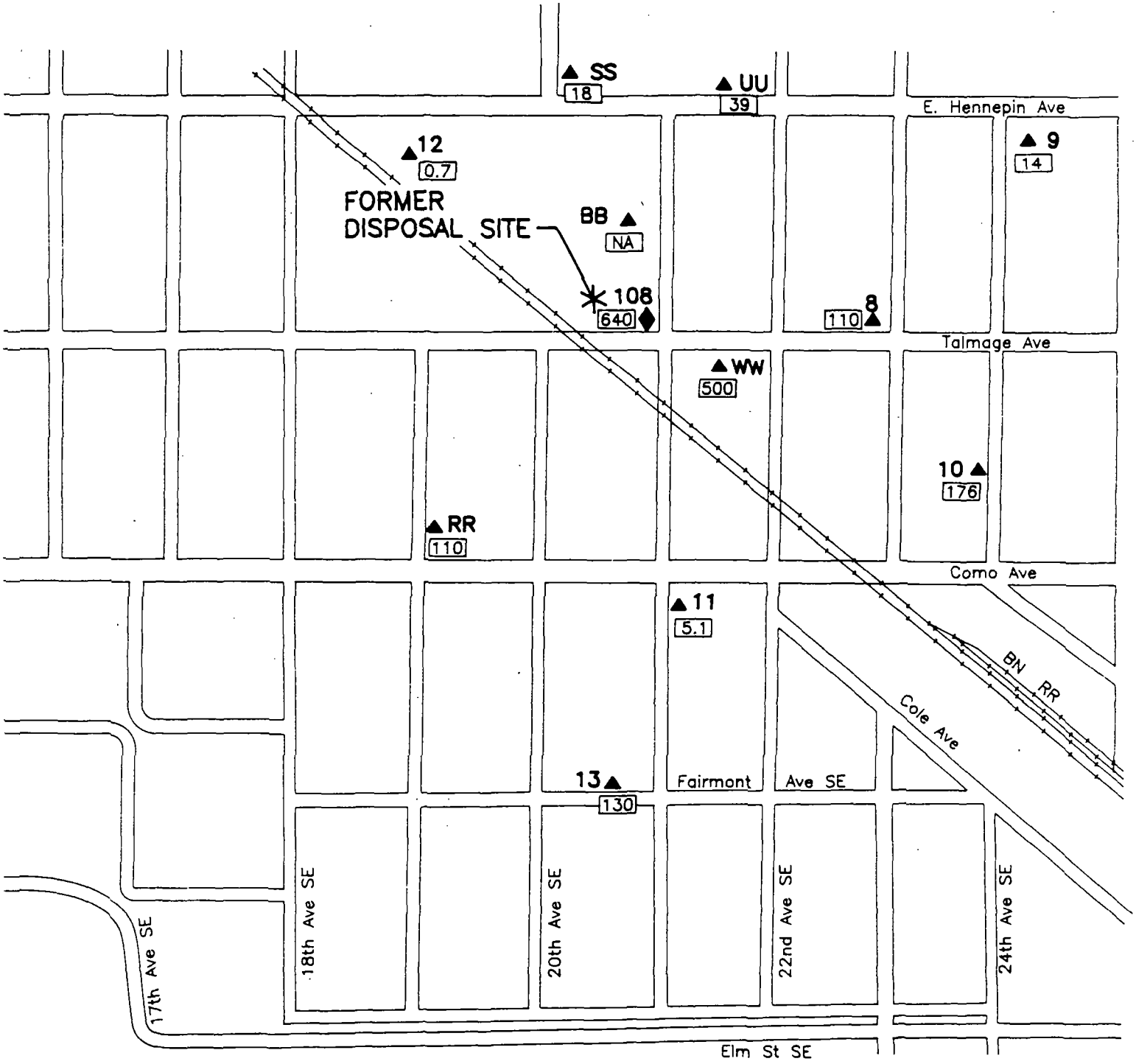
N

0 200 400

SCALE IN FEET

Figure 25

CARIMONA MEMBER
WATER QUALITY (TCE)
May 1990



▲ CARIMONA MEMBER MONITORING WELL

◆ CARIMONA MEMBER PUMP-OUT WELL

640 SUM OF VOLATILE ORGANIC CONCENTRATIONS (ug/L) (VOC)

NA NOT ANALYZED

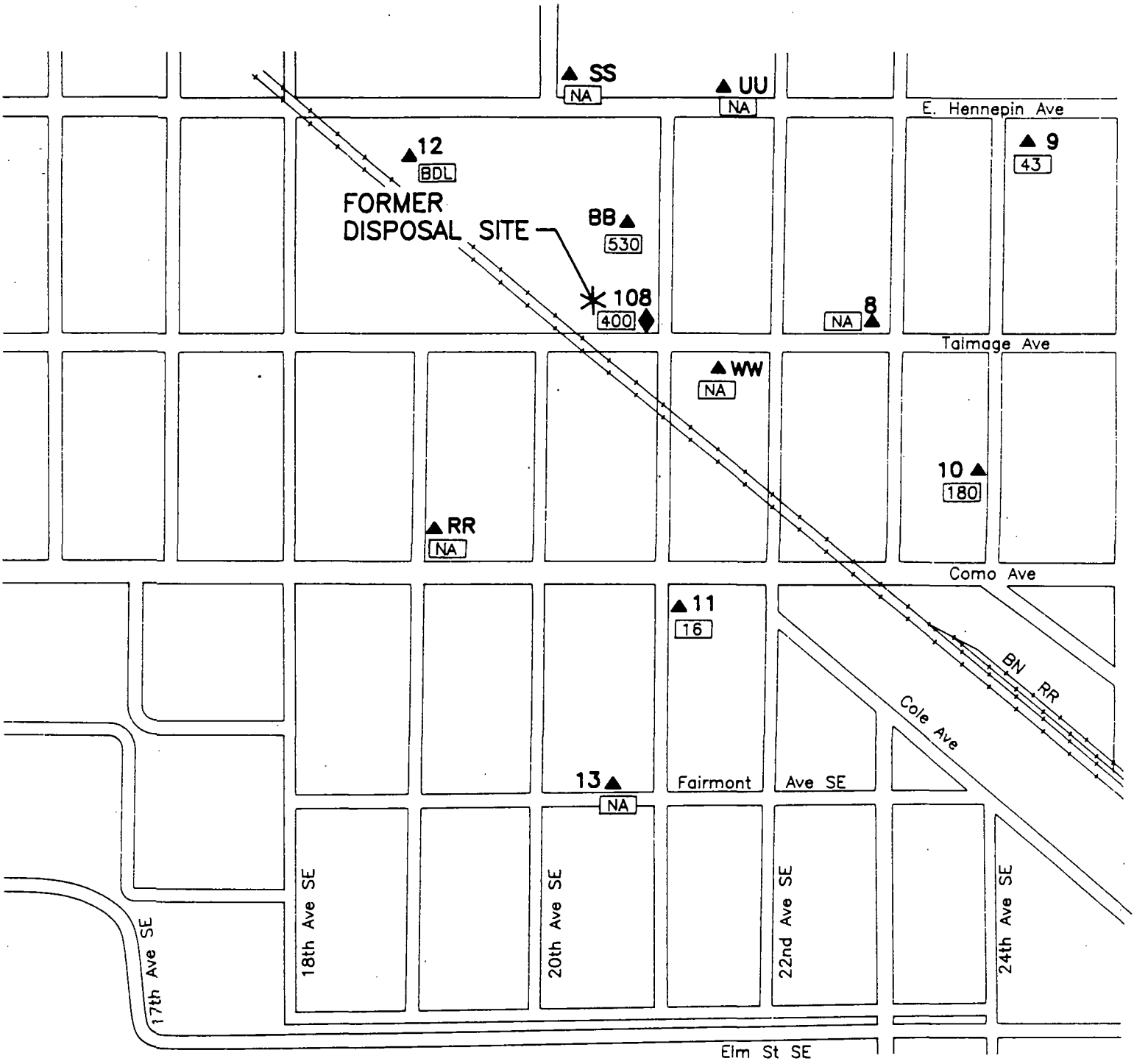
N

0 200 400

SCALE IN FEET

Figure 26

CARIMONA MEMBER
WATER QUALITY (VOC)
May 1990



▲ CARIMONA MEMBER MONITORING WELL

◆ CARIMONA MEMBER PUMP-OUT WELL

400 TRICHLOROETHENE CONCENTRATION (ug/L) (TCE)

BDL BELOW DETECTION LIMIT

NA NOT ANALYZED

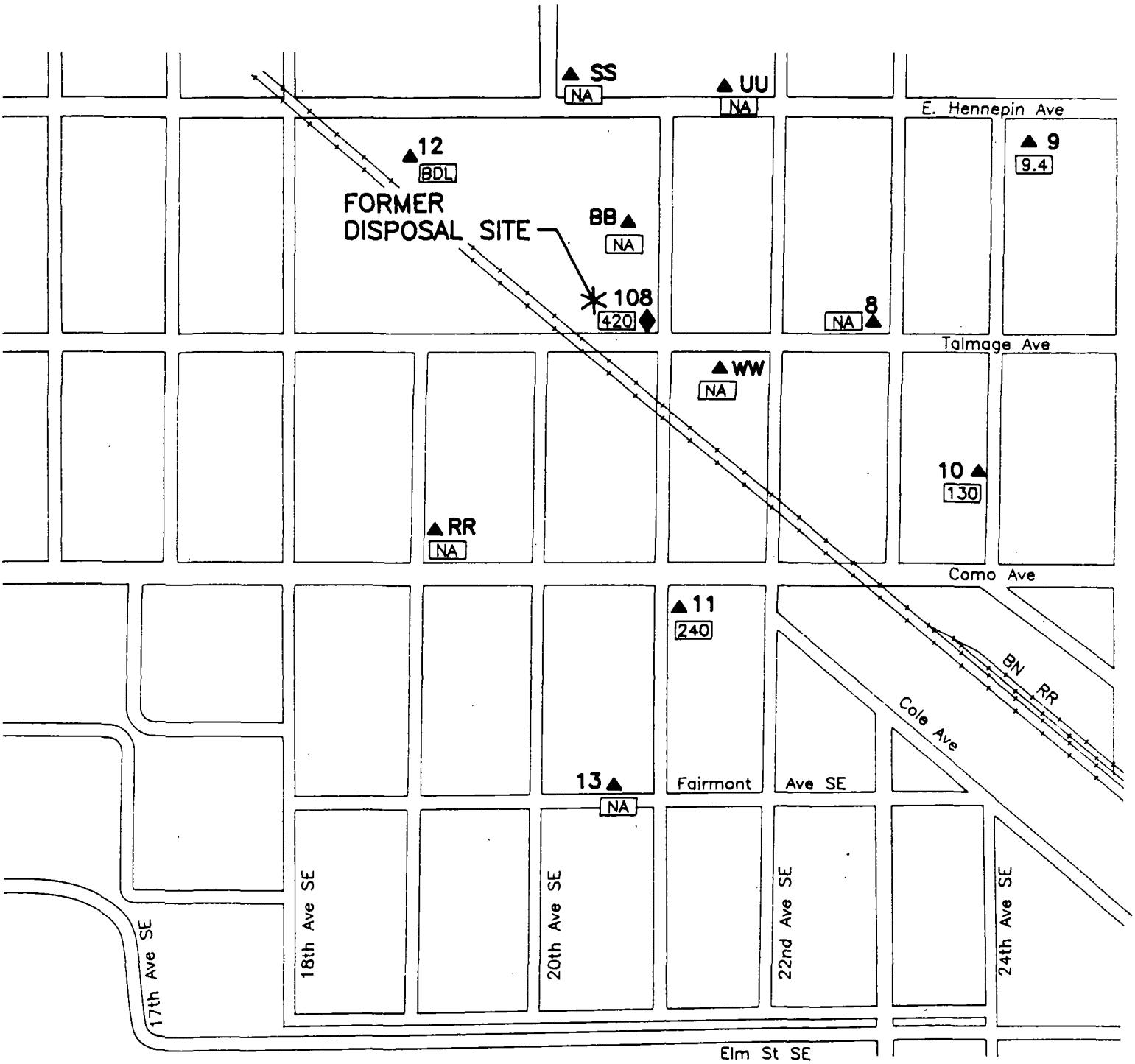
N

0 200 400

SCALE IN FEET

Figure 27

CARIMONA MEMBER
WATER QUALITY (TCE)
July 1990



▲ CARIMONA MEMBER MONITORING WELL

◆ CARIMONA MEMBER PUMP-OUT WELL

[140] TRICHLOROETHENE CONCENTRATION (ug/L) (TCE)

[BDL] BELOW DETECTION LIMIT

[NA] NOT ANALYZED

N

0 200 400

SCALE IN FEET

Figure 28

CARIMONA MEMBER
WATER QUALITY (TCE)
October 1990

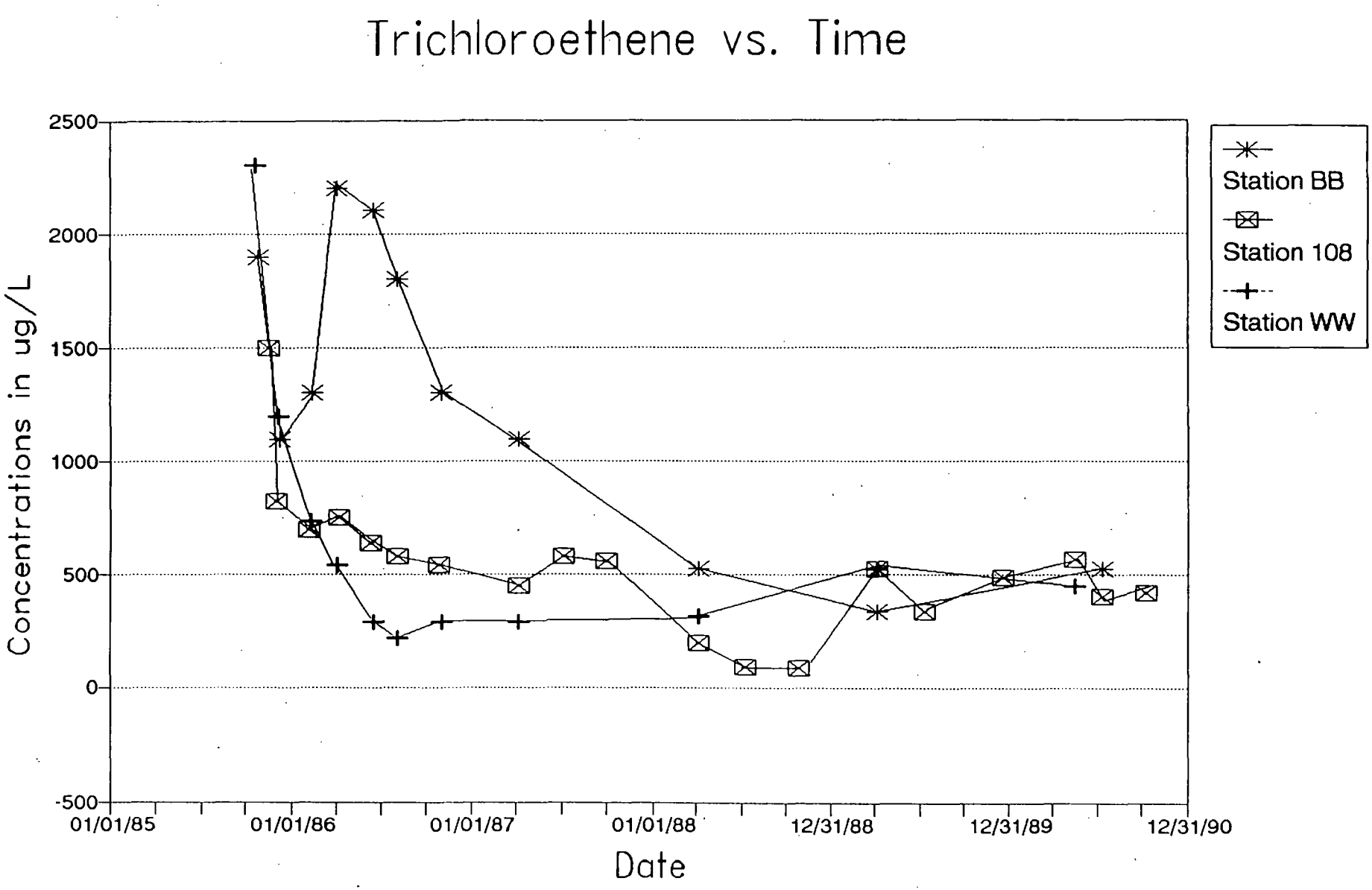


Figure 29

CARIMONA MEMBER WELLS
TCE CONCENTRATION
1985 - 1990

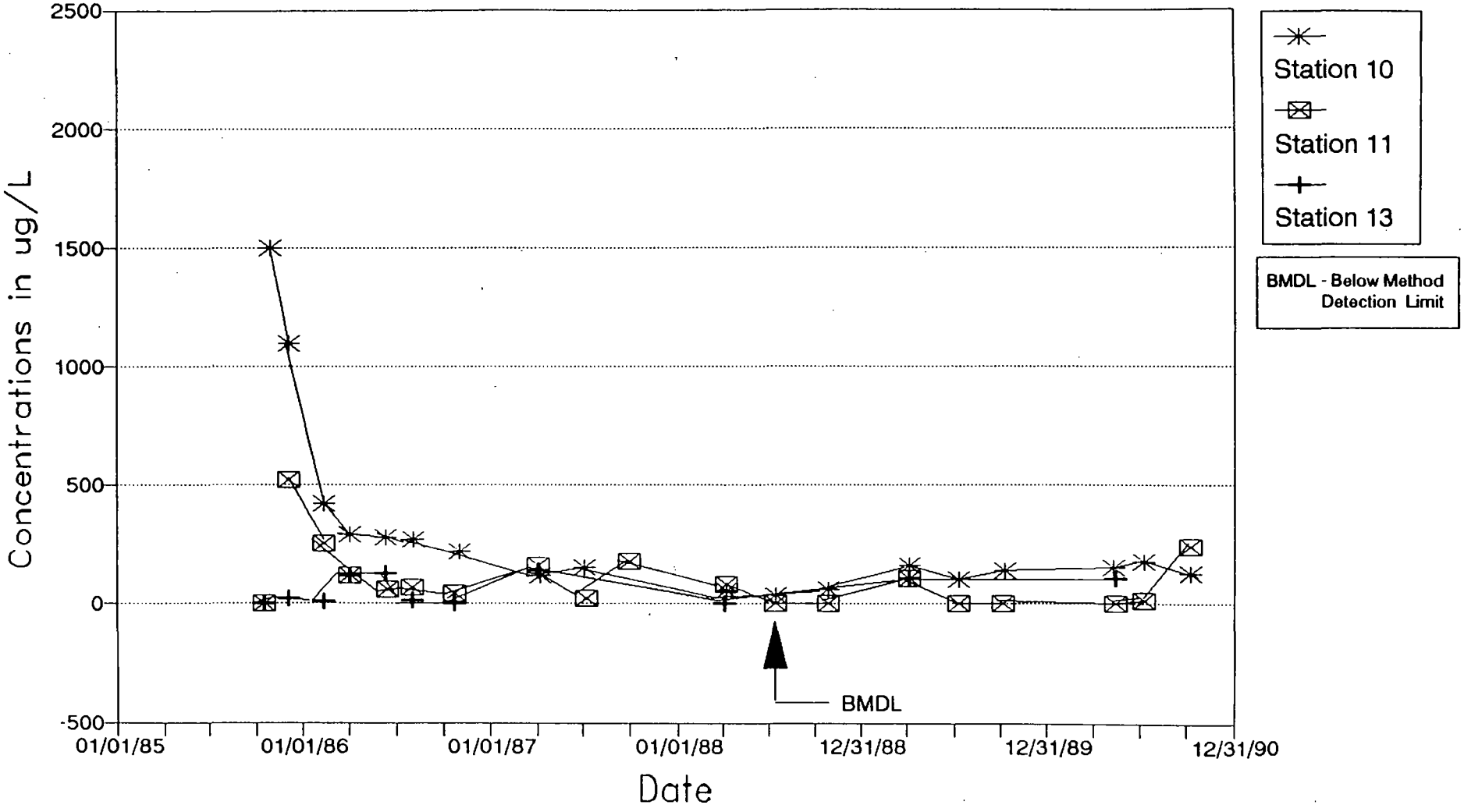
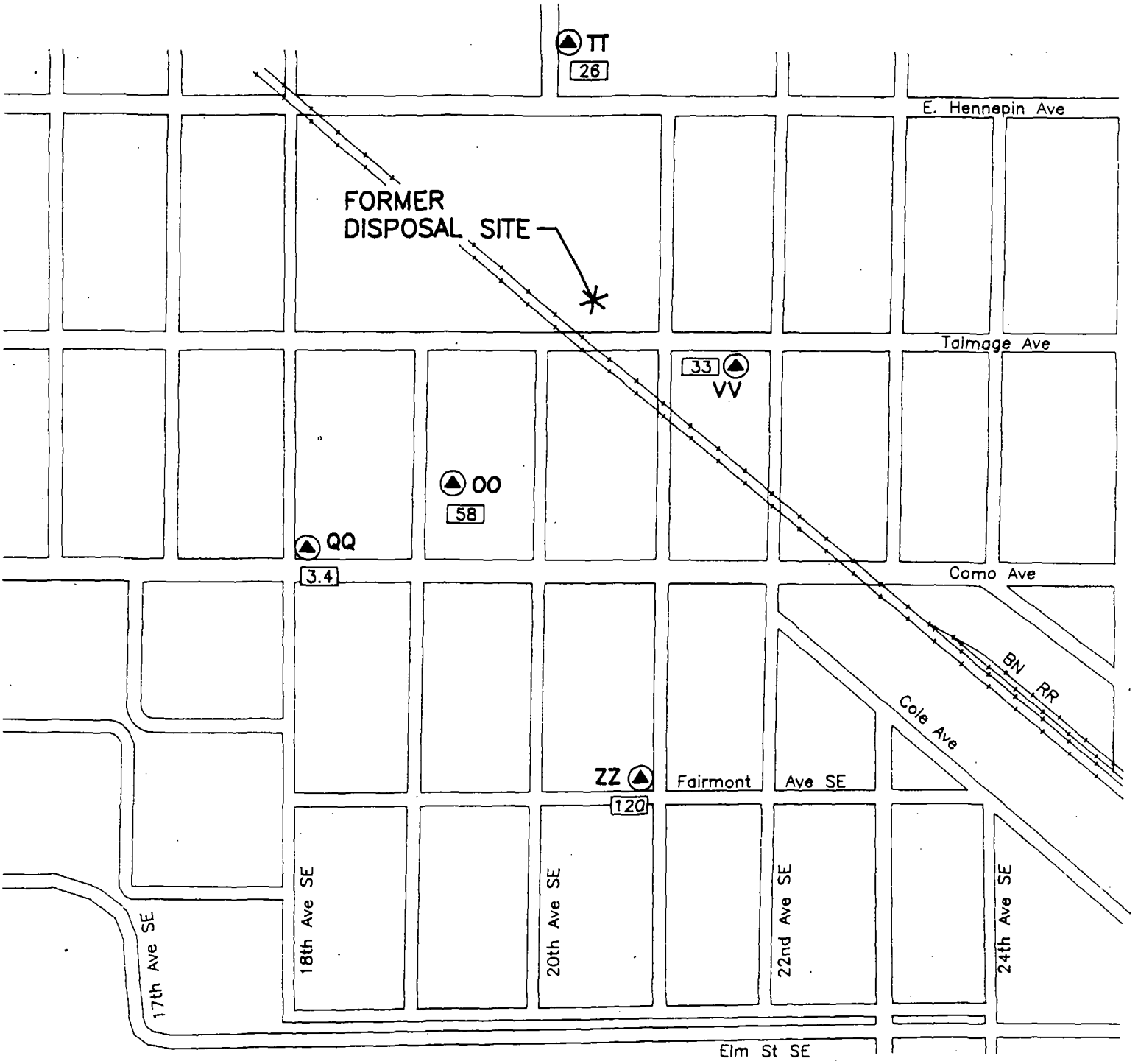


Figure 29 (cont.)

CARIMONA MEMBER WELLS
TCE CONCENTRATION
1985 - 1990



MAGNOLIA MEMBER MONITORING WELL

58 TRICHLOROETHENE CONCENTRATION (ug/L) (TCE)

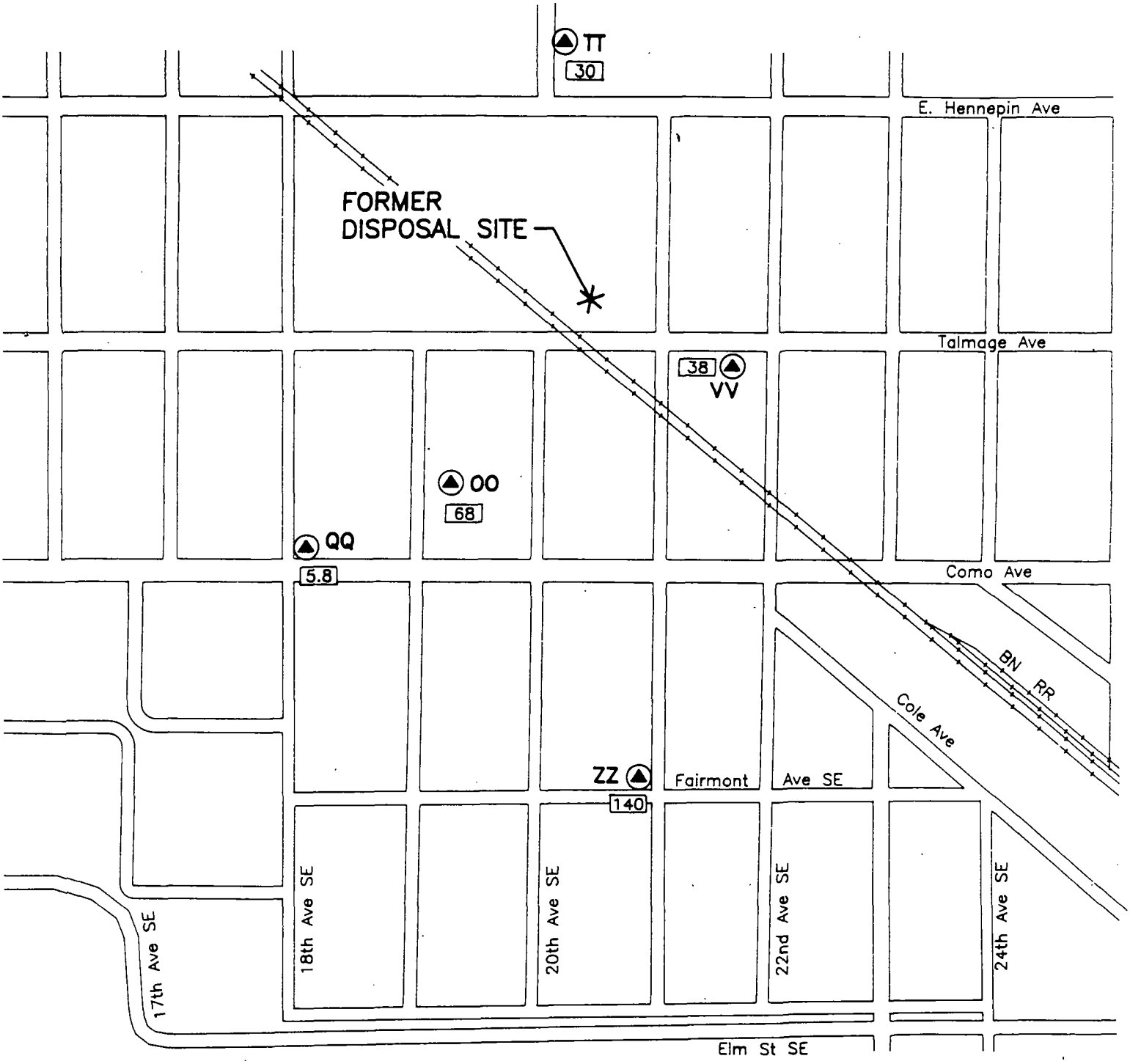
N

0 200 400

SCALE IN FEET

Figure 30

MAGNOLIA MEMBER
WATER QUALITY (TCE)
May 1990



MAGNOLIA MEMBER MONITORING WELL

68 SUM OF VOLATILE ORGANIC CONCENTRATIONS (ug/L) (VOC)

N

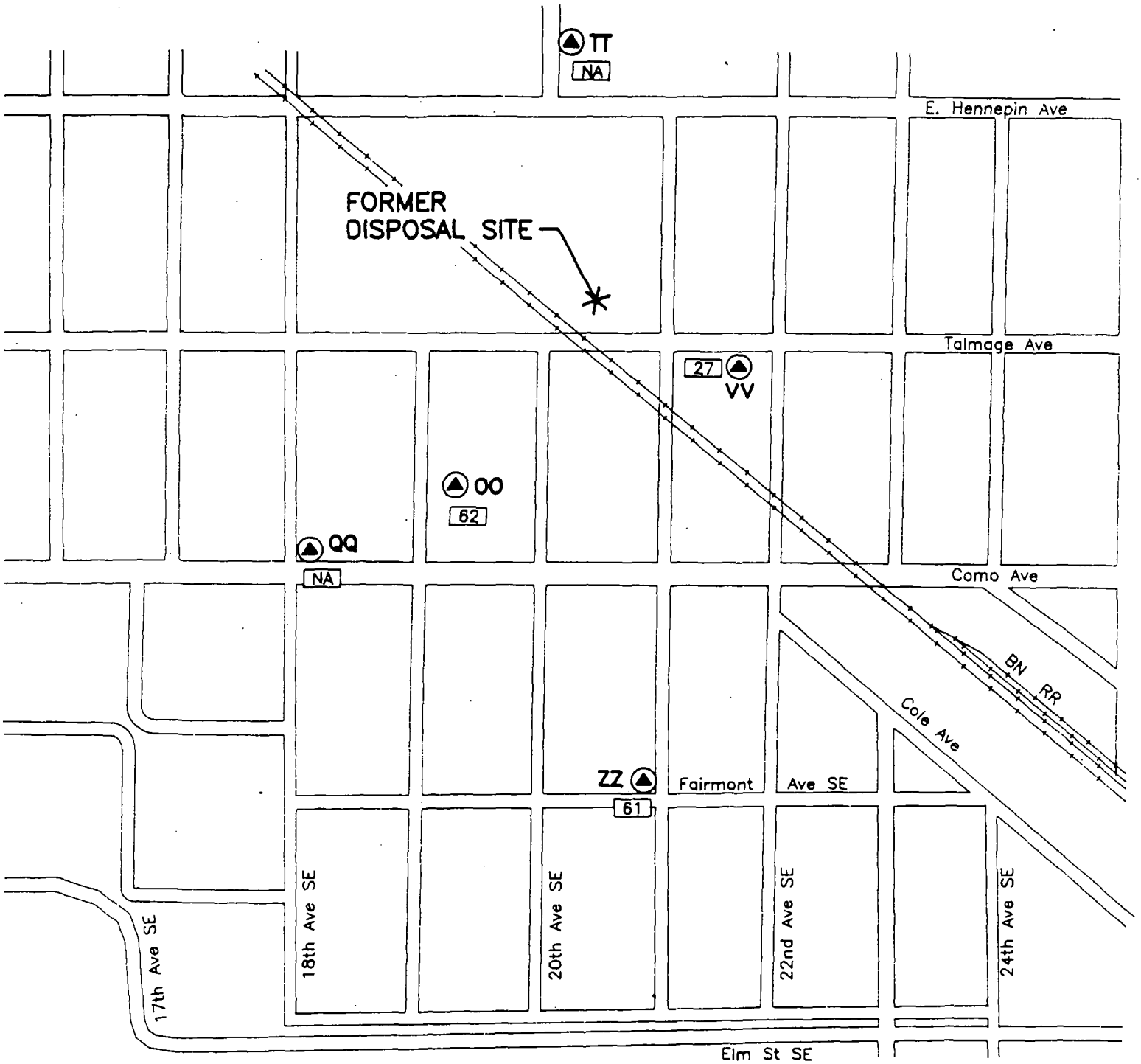
0 200 400

SCALE IN FEET

RJW GM5-F31 11/25/1990 14:01:5

Figure 31

MAGNOLIA MEMBER
WATER QUALITY (VOC)
May 1990



MAGNOLIA MEMBER MONITORING WELL

62 TRICHLOROETHENE CONCENTRATION (ug/L) (TCE)

NA NOT ANALYZED

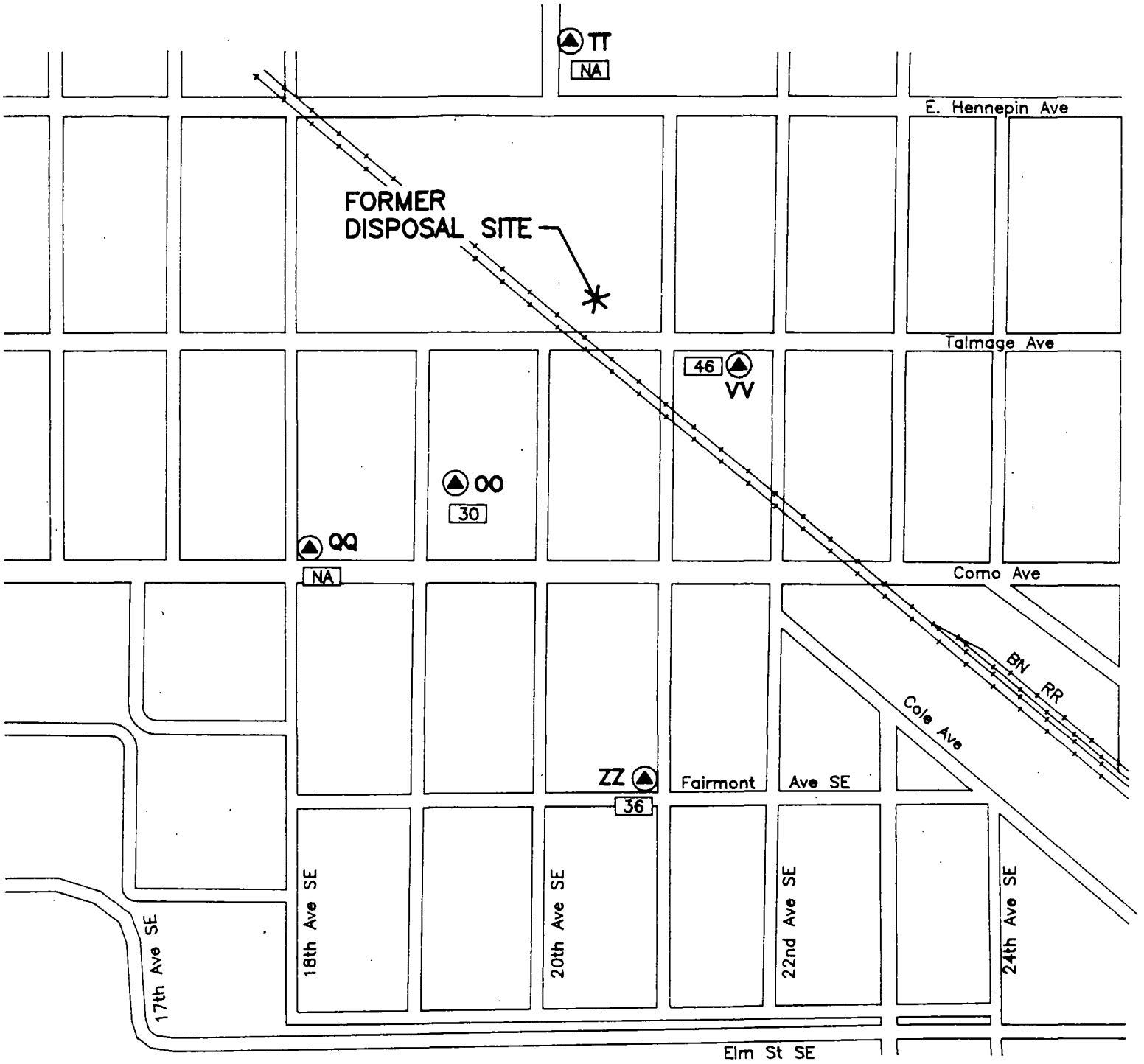
N

0 200 400

SCALE IN FEET

Figure 32

MAGNOLIA MEMBER
WATER QUALITY (TCE)
July 1990



▲ MAGNOLIA MEMBER MONITORING WELL

30 TRICHLOROETHENE CONCENTRATION (ug/L) (TCE)

NA NOT ANALYZED

N

0 200 400

SCALE IN FEET

Figure 33

MAGNOLIA MEMBER
WATER QUALITY (TCE)
October 1990

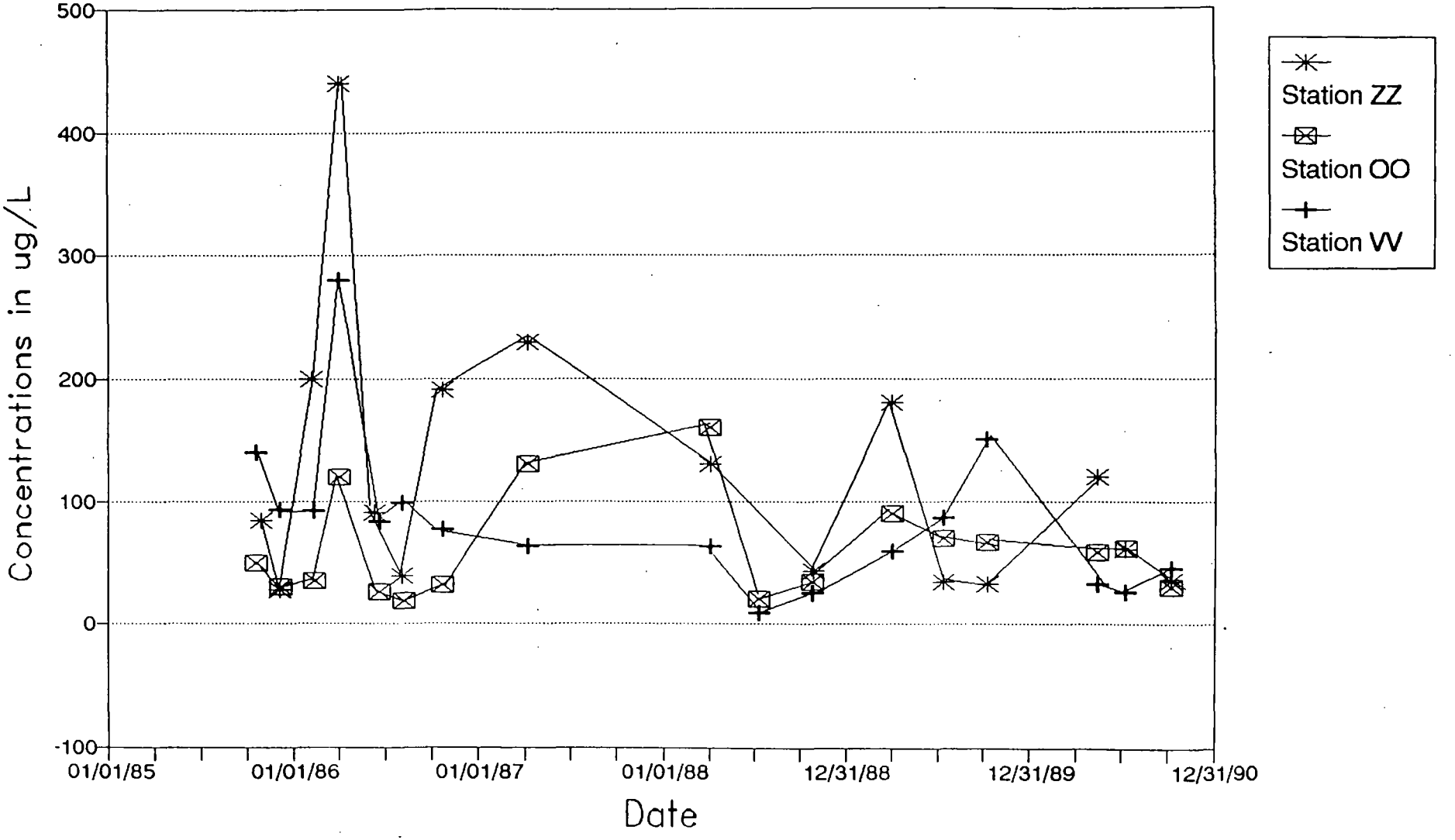
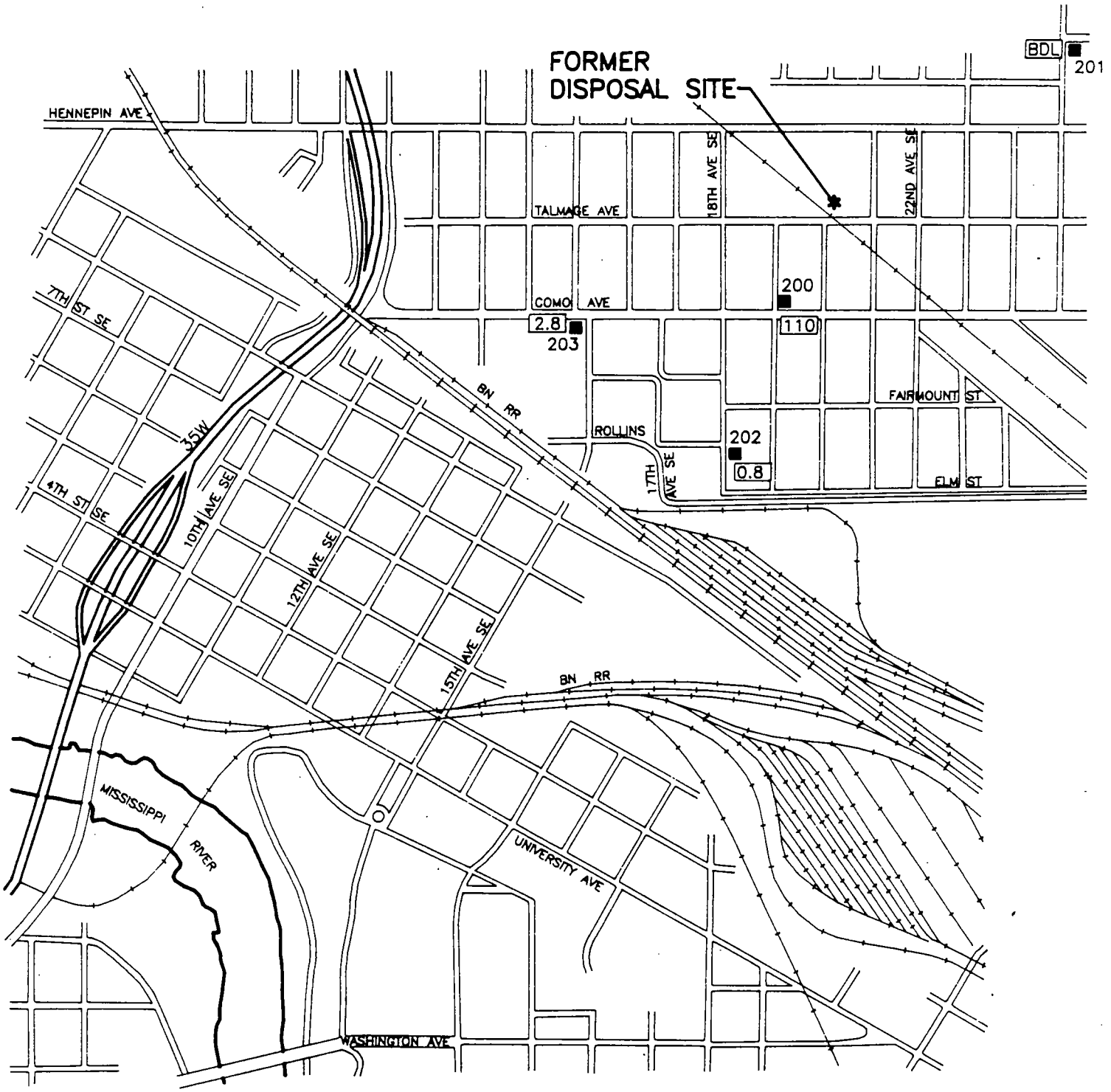


Figure 34

MAGNOLIA MEMBER WELLS
TCE CONCENTRATION
1985-1990



■ ST. PETER MONITORING WELL

110 TRICHLOROETHENE CONCENTRATION (ug/L) (TCE)

BDL BELOW DETECTION LIMIT

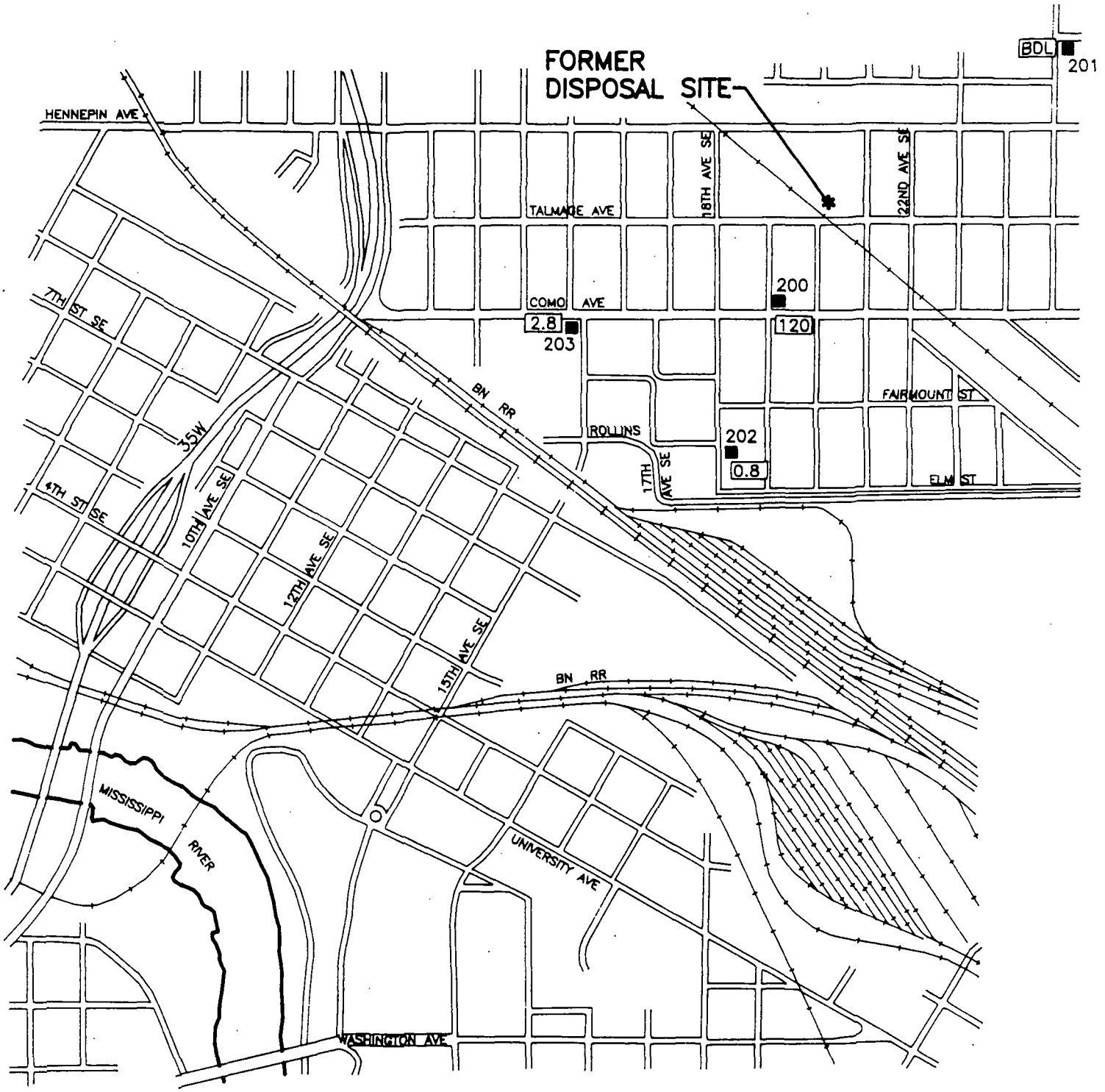
N

0 1000

SCALE IN FEET

Figure 35

ST. PETER
WATER QUALITY (TCE)
May 1990



■ ST. PETER MONITORING WELL

120 SUM OF VOLATILE ORGANIC CONCENTRATIONS (ug/L) (VOC)

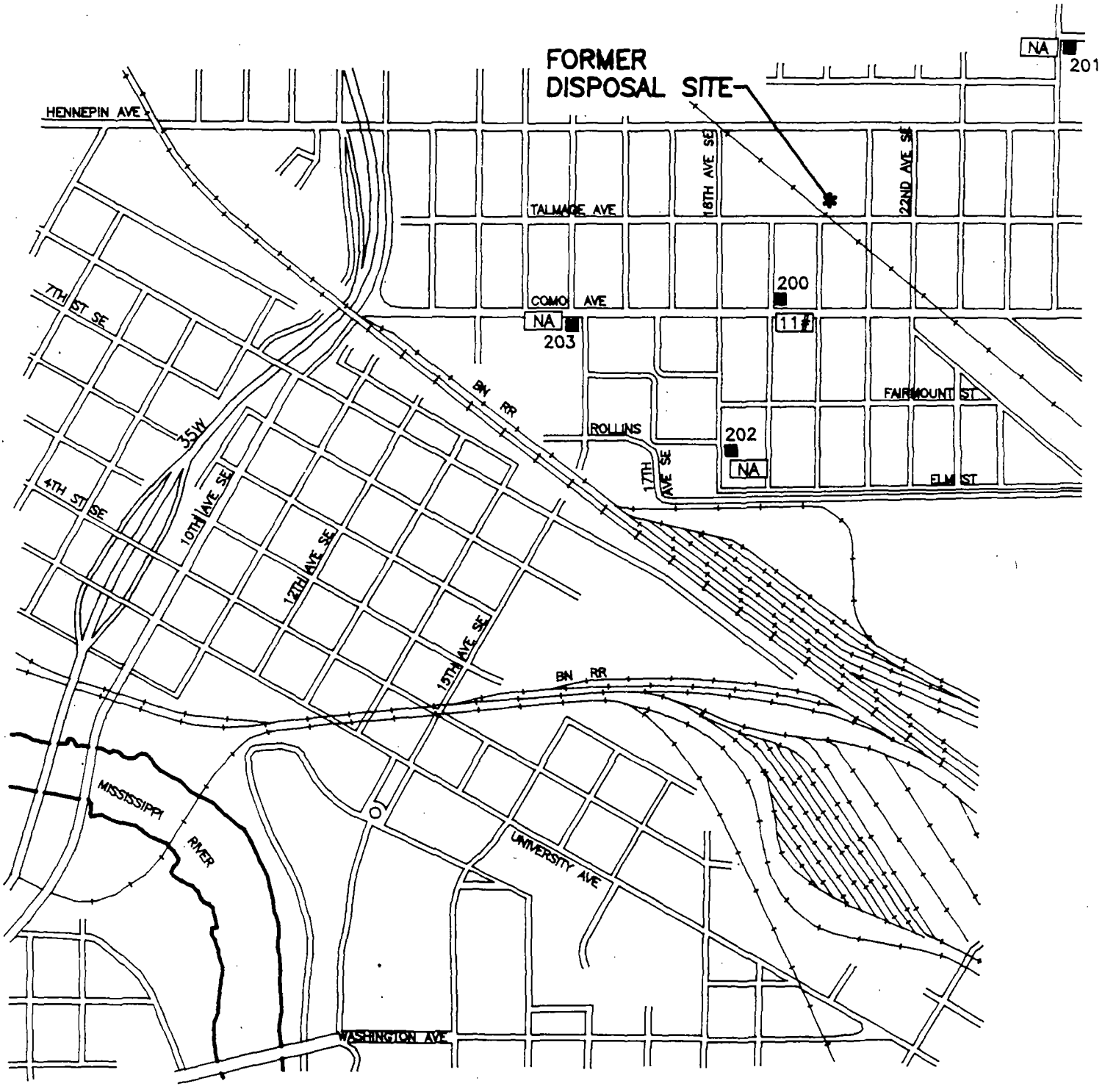
BDL BELOW DETECTION LIMIT

N

0 1000

SCALE IN FEET

Figure 36
ST. PETER
WATER QUALITY (VOC)
May 1990



■ ST. PETER MONITORING WELL

[11] TRICHLOROETHENE CONCENTRATION (ug/L) (TCE)

[NA] NOT ANALYZED

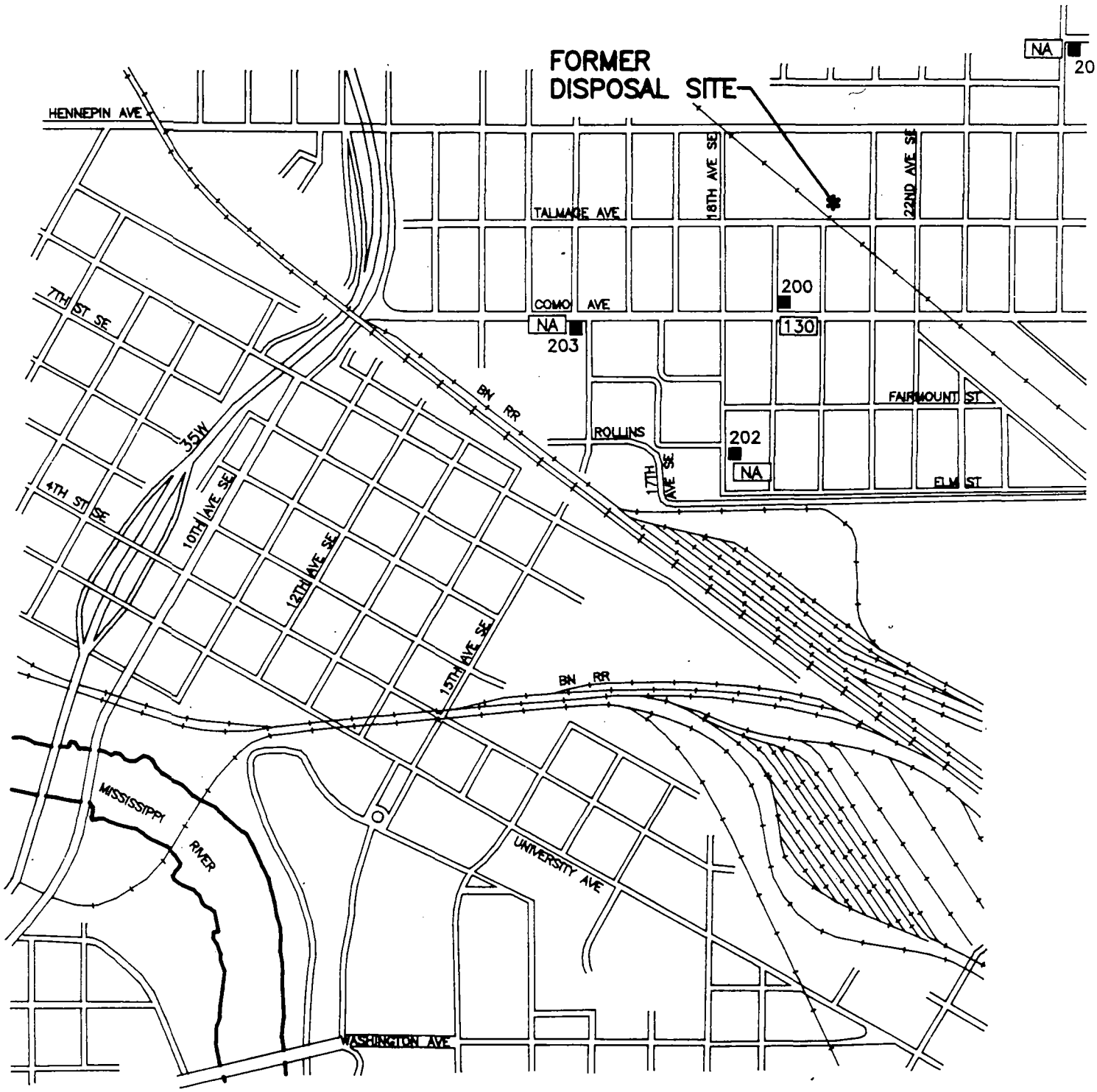
\# VALUE IS LESS THAN HISTORICAL AVERAGE DUE TO POSSIBLE LABORATORY ERROR

0 1000

SCALE IN FEET

Figure 37

ST. PETER
WATER QUALITY (TCE)
July 1990



■ ST. PETER MONITORING WELL

130 TRICHLOROETHENE CONCENTRATION (ug/L) (TCE)

NA NOT ANALYZED

0 1000

SCALE IN FEET

Figure 38

ST. PETER
WATER QUALITY (TCE)
October 1990

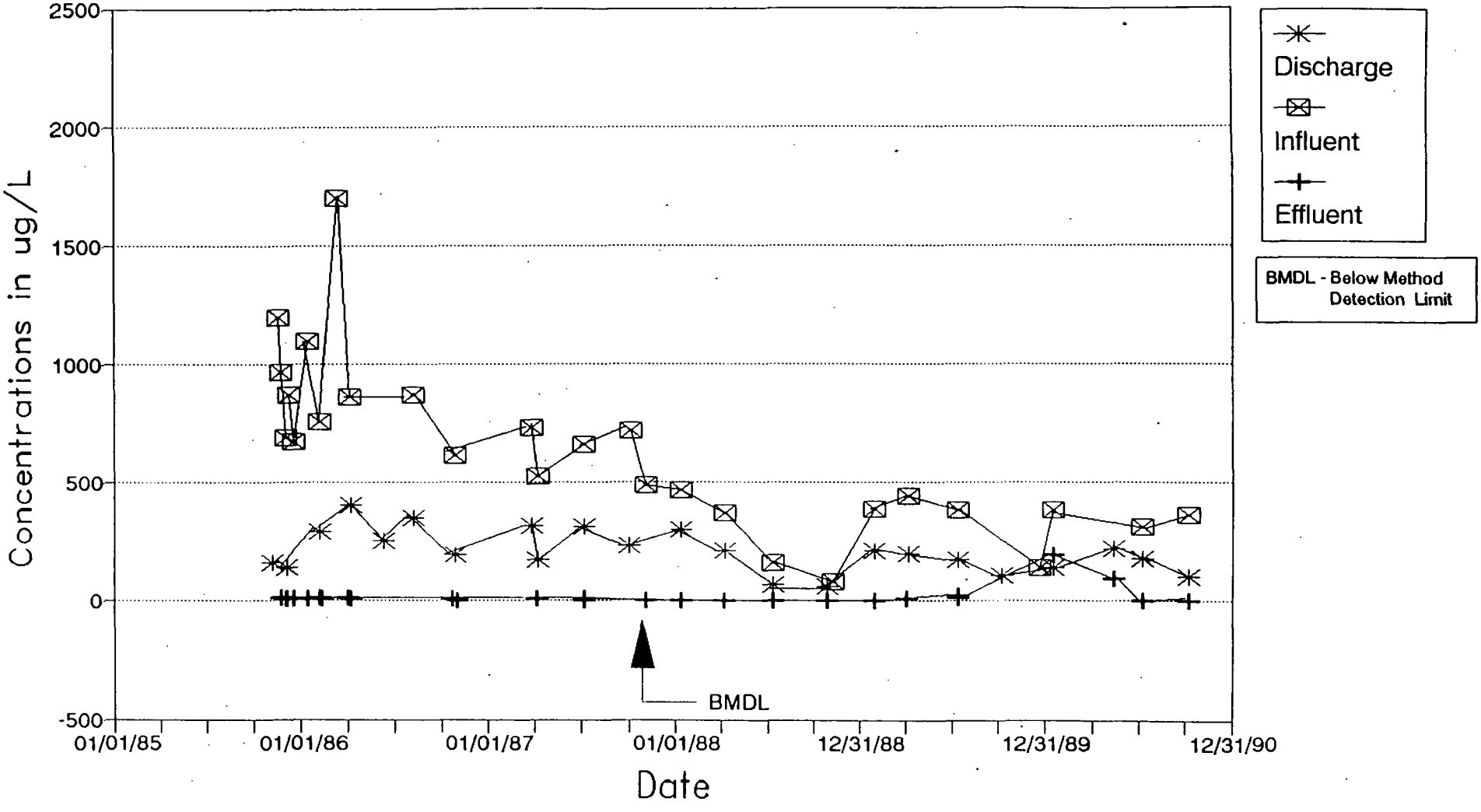


Figure 39

PUMP-OUT SYSTEM DISCHARGE
(111,112,113) AND GROUNDWATER TREATMENT
SYSTEM INFLUENT/EFFLUENT (108,109,110)
TCE CONCENTRATION
1985-1990

Appendices

Appendix A

QA/QC Data

APPENDIX A
QUALITY ASSURANCE/QUALITY CONTROL

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TABLE A-3	1990 Blind Duplicate Data
TABLE A-4	1990 Blind Duplicate Data, Coefficients of Variation

APPENDIX A
QUALITY ASSURANCE/QUALITY CONTROL

INTRODUCTION

A review of quality control data was conducted to assess the integrity of the sampling procedures and analytical results for samples collected from January through December 1990. The quality control data included analytical results from samples collected to determine both internal and external quality control. Internal quality control included initial and ongoing programs of quality assurance performed by PACE and CH_2M Hill Laboratories, in accordance with their laboratory QAPP's. External quality control involved the collection and analysis of field blank samples and blind duplicate samples according to procedures described in the Groundwater Monitoring Quality Control/Quality Assurance Plan submitted to the MPCA in February 1985.

PACE Laboratories analyzed the 1990 water samples for volatile organic compounds (VOCs) using gas chromatography according to Minnesota Department of Health Method 465C. CH_2M Hill Laboratories analyzed the water samples for priority pollutant VOCs with tentatively identified compounds according to EPA Method 624.

INTERNAL QUALITY CONTROL

Intra-laboratory quality control procedures were conducted on a daily basis to determine the acceptability of the analytical results. Internal quality control procedures followed in the analysis of samples for volatile organic compounds included spiking 5 percent of the samples with reference standards and calculating the percent recovery; analyzing 5 percent of the samples in duplicate; and, analyzing daily laboratory blanks to check for system contamination.

Accuracy of the analytical data was assessed by evaluating percent recovery in spiked samples. PACE and CH_2M Hill Laboratories use statistical control procedures to establish and track data accuracy.

Data precision was assessed by evaluating laboratory duplicate analyses. A duplicate analysis is a replicate of a separate aliquot of the sample which has been taken through the same preparation procedures as the original sample. A coefficient of variation was computed for each duplicate set of results. Quality control data generated during the analysis of samples demonstrated acceptable precision.

Laboratory deionized water blanks were analyzed periodically throughout the analysis of samples. The results of analysis of laboratory blanks were used to evaluate potential system contamination which may contribute to possible false positive values. The mean, standard deviation, and upper limit of the 95 percent confidence interval were calculated for each set of laboratory blanks. A one-tailed student's t-test was used to compute the 95 percent confidence interval. Deionized water blanks which were analyzed to determine background contamination were treated as a separate set of laboratory blanks. Possible false positive values were defined as concentrations less than the upper limit of the 95 percent confidence interval. These values are footnoted with an "s" in the data tables.

EXTERNAL QUALITY CONTROL

External quality control procedures were used to assess laboratory precision and accuracy and the effect of sample bottle preparation and handling processes on the quality of the analytical results. Procedures included the analysis of: field blanks for detection of contamination introduced during sample collection and blind duplicate samples as a check on the reproducibility of the analytical data.

Ten field blank samples were collected and analyzed for volatile organic compounds. The results from the analysis of volatile organic compounds are presented in Table A-1. Trichloroethene was detected in the field blank during the May and October 1990 sampling

events. Methylene chloride and acetone were detected in the field blank samples collected during the May 1990 sampling event. Toluene was also detected in a field blank sample collected during the May 1990 sampling event. The mean, standard deviation and upper limit of the 95 percent confidence interval were calculated for the field blanks collected during each sampling period (Table A-2). Possible false positive values were defined as concentration less than the upper limit of the 95 percent confidence interval. These values are footnoted with an "s" in the data tables.

Seven samples were collected in duplicate and the results of the analysis are shown in Table A-3. A coefficient of variation was computed from the results of analysis reported for each duplicate pair (Table A-4). The coefficient of variation for each duplicate pair collected during May and July 1990 sampling was found to be less than 25 percent, indicating acceptable reproducibility of analytical results by PACE Laboratories. One duplicate pair collected during October sampling was found to have a coefficient of variation greater than 25 percent. Coefficients of variation which are greater than 25 percent for blind duplicate samples are outside the range of generally accepted reproducibility standards.

Tables

TABLE A-1

1990 BLANK SAMPLE DATA

(concentrations in ug/L)

	BLANKS				
	05/15/90	05/16/90	05/16/90	05/17/90	05/17/90
Chloromethane	--	--	--	--	<10
Bromomethane	--	--	--	--	<10
Vinyl Chloride	--	--	--	--	<10
Chloroethane	--	--	--	--	<10
Methylene Chloride	--	--	--	--	4 j
Acetone	--	--	--	--	8 j
Carbondisulfide	--	--	--	--	<5
Dichlorodifluoromethane	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	<5
1,1-Dichloroethylene	--	--	--	--	<5
1,1-Dichloroethane	<0.2	<0.2	<0.2	<0.2	<5
1,2-Dichloroethylene (cis/trans)	--	--	--	--	<5
1,2-Dichloroethylene, trans	<0.3	<0.3	<0.3	<0.3	--
1,2-Dichloroethylene, cis	<0.5	<0.5	<0.5	<0.5	--
Chloroform	--	--	--	--	<5
1,2-Dichloroethane	<0.2	<0.2	<0.2	<0.2	<5
Methyl Ethyl Ketone	--	--	--	--	<10
1,1,1-Trichloroethane	<0.5	<0.5	<0.5	<0.5	<5
Carbon Tetrachloride	--	--	--	--	<5
Vinyl Acetate (Vinyl Ester)	--	--	--	--	<10
Bromodichloromethane	--	--	--	--	<5
1,2-Dichloropropane	--	--	--	--	<5
Cis-1,3-Dichloro-1-propene	--	--	--	--	<5
Trichloroethene	1.3	<0.5	<0.5	<0.5	<5
Chlorodibromomethane	--	--	--	--	<5
1,1,2-Trichloroethane	--	--	--	--	<5
Benzene	--	--	<1.0	--	<5
Trans-1,3-Dichloro-1-propene	--	--	--	--	<5
2-Chloroethylvinyl Ether	--	--	--	--	<10
Bromoform	--	--	--	--	<5
2-Hexanone	--	--	--	--	<10
Methyl Isobutyl Ketone	--	--	--	--	<10
Tetrachloroethylene	<1.0	<1.0	<1.0	<1.0	<5
1,1,2,2-Tetrachloroethane	<1.0	<1.0	<1.0	<1.0	<5
Toluene	--	--	<1.0	--	<5
Chlorobenzene	--	--	--	--	<5
Ethyl Benzene	--	--	--	--	<5
Styrene	--	--	--	--	<5
Xylenes	--	--	<1.0	--	<5
1,3-Dichlorobenzene	--	--	--	--	<5
1,4-Dichlorobenzene	--	--	--	--	<5
1,2-Dichlorobenzene	--	--	--	--	<5
Tetrahydrofuran	--	--	--	--	<5

j Quantified value is less than method detection limit.
-- Not analyzed.

TABLE A-1 (cont.)

1990 BLANK SAMPLE DATA

(concentrations in ug/L)

	BLANKS				
	05/17/90	07/11/90	07/12/90	10/09/90	10/10/90
Chloromethane	<10	--	--	<1.0	<1.0
Bromomethane	<10	--	--	<1.0	<1.0
Vinyl Chloride	<10	--	--	<1.0	<1.0
Chloroethane	<10	--	--	<0.5	<0.5
Methylene Chloride	22	--	--	<1.0	<1.0
Acetone	16	--	--	--	--
Carbondisulfide	<5	--	--	--	--
Dichlorodifluoromethane	--	--	--	<2.0	<2.0
Trichlorofluoromethane	<5	--	--	<1.0	<1.0
1,1-Dichloroethylene	<5	--	--	<0.5	<0.5
1,1-Dichloroethane	<5	--	--	<0.5	<0.5
1,2-Dichloroethylene (cis/trans)	<5	--	--	--	--
1,2-Dichloroethylene, trans	--	--	--	<0.5	<0.5
1,2-Dichloroethylene, cis	--	--	--	<0.5	<0.5
Chloroform	<5	--	--	<0.5	<0.5
1,2-Dichloroethane	<5	--	--	<0.5	<0.5
Methyl Ethyl Ketone	<10	--	--	--	--
1,1,1-Trichloroethane	<5	--	--	<0.5	<0.5
Carbon Tetrachloride	<5	--	--	<0.5	<0.5
Vinyl Acetate (Vinyl Ester)	<10	--	--	--	--
Bromodichloromethane	<5	--	--	<0.5	<0.5
1,2-Dichloropropane	<5	--	--	<0.5	<0.5
Cis-1,3-Dichloro-1-propene	<5	--	--	<0.5	<0.5
Trichloroethene	<5	<0.5	<0.5	<0.5	1.6
Chlorodibromomethane	<5	--	--	<0.5	<0.5
1,1,2-Trichloroethane	<5	--	--	<0.5	<0.5
Benzene	<5	--	--	<0.5	<0.5
Trans-1,3-Dichloro-1-propene	<5	--	--	<0.5	<0.5
2-Chloroethylvinyl Ether	<10	--	--	--	--
Bromoform	<5	--	--	<0.5	<0.5
2-Hexanone	<10	--	--	--	--
Methyl Isobutyl Ketone	<10	--	--	--	--
Tetrachloroethylene	<5	--	--	<0.5	<0.5
1,1,2,2-Tetrachloroethane	<5	--	--	<0.5	<0.5
Toluene	1 j	--	--	<1.0	<1.0
Chlorobenzene	<5	--	--	<0.5	<0.5
Ethyl Benzene	<5	--	--	<0.5	<0.5
Styrene	<5	--	--	--	--
Xylenes	<5	--	--	<0.5	<0.5
1,3-Dichlorobenzene	<5	--	--	<0.5	<0.5
1,4-Dichlorobenzene	<5	--	--	<0.5	<0.5
1,2-Dichlorobenzene	<5	--	--	<0.5	<0.5
Tetrahydrofuran	<5	--	--	--	--

---

j Quantified value is less than method detection limit.
-- Not analyzed.

.001

TABLE A-2

1990 FIELD BLANK DATA
RESULTS OF STATISTICAL ANALYSIS

(concentrations in µg/L)

	May 1990			July 1990			October 1990		
	$\bar{x}$	s	UCL	$\bar{x}$	s	UCL	$\bar{x}$	s	UCL
Parameter									
1,1-Dichloroethane	BDL	0	BDL	--	--	--	BDL	0	BDL
1,2-Dichloroethane	BDL	0	BDL	--	--	--	BDL	0	BDL
1,1,2,2-Tetrachloroethane	BDL	0	BDL	--	--	--	BDL	0	BDL
1,1,1-Trichloroethane	BDL	0	BDL	--	--	--	BDL	0	BDL
1,2-Dichloroethene, cis	BDL	0	BDL	--	--	--	BDL	0	BDL
1,2-Dichloroethene, trans	BDL	0	BDL	--	--	--	BDL	0	BDL
Tetrachloroethene	BDL	0	BDL	--	--	--	BDL	0	BDL
Trichloroethene	1.18	1.10	3.40	BDL	0	BDL	0.93	0.95	6.92
Benzene	BDL	0	BDL	--	--	--	BDL	0	BDL
Toluene	1.33	1.04	4.37	--	--	--	BDL	0	BDL
Xylenes	BDL	0	BDL	--	--	--	BDL	0	BDL

UCL: Upper limit of 95 percent confidence interval calculated using a one-tailed student's t-test.

BDL: Below laboratory detection limit.

-- : Not analyzed.

TABLE A-3

1990 BLIND DUPLICATE DATA

(concentrations in ug/L)

	201		W		TT		200	
	05/15/90 Sample	05/15/90 Duplicate	05/16/90 Sample	05/16/90 Duplicate	05/16/90 Sample	05/16/90 Duplicate	05/16/90 Sample	05/16/90 Duplicate
1,1-Dichloroethane	<0.2	<0.2	<0.2	<0.2	0.5	0.6	0.6	0.5
1,2-Dichloroethane	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichloroethylene, cis	<0.5	<0.5	19	15	3.6	4.1	10	8.2
1,2-Dichloroethylene, trans	<0.3	<0.3	0.9	0.8	<0.3	<0.3	<0.3	<0.3
1,1,2,2-Tetrachloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.3	0.7
Trichloroethene	<0.5	<0.5	31	25	26	31	110	80

	ZZ		11		ZZ	
	07/11/90 Sample	07/11/90 Duplicate	10/09/90 Sample	10/09/90 Duplicate	10/09/90 Sample	10/09/90 Duplicate
1,1-Dichloroethane	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--
1,2-Dichloroethylene, cis	--	--	--	--	--	--
1,2-Dichloroethylene, trans	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--
Tetrachloroethylene	--	--	--	--	--	--
1,1,1-Trichloroethane	--	--	--	--	--	--
Trichloroethene	61	64	240	100	36	35

-- Not analyzed.

.011

TABLE A-4

1990 BLIND DUPLICATE DATA
COEFFICIENTS OF VARIATION

Well	Date	Coefficient of Variation
201	05/15/90	0.00
W	05/16/90	0.08
TT	05/16/90	0.07
200	05/16/90	0.18
ZZ	07/11/90	0.03
11	10/09/90	0.58
ZZ	10/09/90	0.02

Appendix B

Recommended 1991 Monitoring Plan

APPENDIX B
RECOMMENDED 1991 MONITORING PLAN

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APPENDIX B
RECOMMENDED 1991 MONITORING PLAN

INTRODUCTION

The following monitoring plan is recommended for the period January 1, 1991 through December 31, 1991 to fulfill the requirements of Section 1.9 of Part II of Exhibit A to the Order by Consent between General Mills, Inc. and the MPCA dated October 12, 1984. The recommended 1991 monitoring plan reduces the number of monitoring stations and sampling frequencies based on the reliability of data collected during five years of operating the pump-out and groundwater treatment systems. The 1991 monitoring locations are shown on Figures B-1 through B-4. Water quality samples collected during the second quarter will be analyzed for volatile compounds presented in Table B-2. Water quality samples collected during the fourth quarter will be analyzed for trichloroethene. Monitoring of site pump-out well effluent (108, 109, and 110), downgradient pump-out well effluent (111, 112, and 113), and stripper tower effluent will be conducted according to NPDES Permit MN0056022. A summary of the sampling schedule including monitoring activities and parameters for analysis are presented by monitoring location and sampling period in Table B-1.

GROUNDWATER MONITORING

Glacial Drift

The following monitoring program will be followed to monitor the continued effectiveness of the glacial drift pump-out systems:

- Water levels will be measured in Wells 1, 3, B, Q, S, T, U, V, W, X, 109, 110, 111, 112, and 113 during the second and fourth quarters.

- Samples will be collected from Wells 1, 3, B, Q, S, T, U, V, W, and X during the second quarter and analyzed for the List 1 compounds in Table B-2.

- Samples will also be collected from Wells 1, 3, S, V, and W during the fourth quarter and analyzed for trichloroethene.

Carimona Member

The following monitoring program will be observed to confirm the Carimona pump-out system continues to influence the Carimona in the vicinity of the East Hennepin Avenue site:

- Water levels will be measured in Wells 8, 9, 10, 11, 12, 13, 108, BB, RR, SS, UU, and WW during the second, and fourth quarters.

- Samples will be collected from Wells 8, 9, 10, 11, 12, 13, 108, BB, RR, SS, UU, and WW during the second quarter and analyzed for the List 1 compounds in Table B-2.

- Samples will also be collected from Wells 9, 10, 11, 12, and 108 during the fourth quarter and analyzed for trichloroethene.

Magnolia Member

- Water levels will be measured in Wells OO, QQ, TT, VV, and ZZ during the second and fourth quarters.

- Samples will be collected from Wells OO, QQ, TT, VV, and ZZ, during the second quarter and analyzed for the List 1 compounds in Table B-2.

- Samples will also be collected from Wells OO, VV, and ZZ during the fourth quarter and analyzed for trichloroethene.

St. Peter

- Water levels will be measured in Wells 200, 201, 202, and 203 during the second and fourth quarters.

- Samples will be collected from Wells 200, 201, 202, and 203 during the second quarter and analyzed for the List 1 compounds in Table B-2.

- Well 200 will be sampled in the fourth quarter and analyzed for trichloroethene.

Prairie du Chien (Henkel Well)

Due to the shutdown of the former Henkel Corporation facility, the Henkel well is not anticipated to be operable during 1991. However, if the Henkel well becomes operable during 1991, it will be sampled once and analyzed for the List 1 compounds in Table B-2.

REPORTING

Quarterly

General Mills shall submit the analytical results to the MPCA Project Leader by the 15th day of the month following completion of all analyses of samples collected during the previous quarterly sampling event.

Annual Monitoring Report

General Mills shall submit an annual monitoring report for the previous calendar year to the MPCA Project Leader on or before January 15, 1992. Each annual report shall contain the following information:

- Results of all water level measurements and chemical analyses for the previous calendar year.

- Water level contour maps for each aquifer showing high and low groundwater levels.

- Vertical cross sections of the glacial drift groundwater elevations between Wells 1 and W.

- Maps showing the sum of the List 1 compounds listed in Table B-2 for each well location monitored during the second quarter sampling event, and maps showing the TCE concentrations for each monitoring location of each sampling event.

- A discussion and summary of the reporting year's data in comparison to previously available data.

- A proposed sampling plan for the next monitoring year including an assessment of the monitoring parameters and frequencies, and the feasibility for the deletion of monitoring wells, parameters, or a decrease in sampling frequency.

Tables

TABLE B-1

RECOMMENDED 1991 WATER LEVEL MONITORING LOCATIONS

	Monitoring Station	Apr-May Monitoring	Oct-Nov Monitoring
Glacial Drift	1	WL[1]	WL
	3	WL	WL
	109[2]	WL	WL
	110[2]	WL	WL
	111[2]	WL	WL
	112[2]	WL	WL
	113[2]	WL	WL
	B	WL	WL
	Q	WL	WL
	S	WL	WL
	T	WL	WL
	U	WL	WL
	V	WL	WL
	W	WL	WL
	X	WL	WL
Carimona	8	WL	WL
	9	WL	WL
	10	WL	WL
	11	WL	WL
	12	WL	WL
	13	WL	WL
	108[2]	WL	WL
	BB	WL	WL
	RR	WL	WL
	SS	WL	WL
	UU	WL	WL
	WW	WL	WL
Magnolia	OO	WL	WL
	QQ	WL	WL
	TT	WL	WL
	VV	WL	WL
	ZZ	WL	WL
St. Peter	200	WL	WL
	201	WL	WL
	202	WL	WL
	203	WL	WL

[1]Water level measurement
[2]Pump-out well

TABLE B-1 (Continued)

RECOMMENDED 1991 MONITORING
STATIONS AND SAMPLING FREQUENCIES

	Monitoring Station	Apr-May Parameter Monitoring	Oct-Nov Parameter Monitoring
Glacial Drift	1	List 1[3]	TCE
	3	List 1	TCE
	B	List 1	--
	Q	List 1	--
	S	List 1	TCE
	T	List 1	--
	U	List 1	--
	V	List 1	TCE
	W	List 1	TCE
	X	List 1	--
Carimona	8	List 1	--
	9	List 1	TCE
	10	List 1	TCE
	11	List 1	TCE
	12	List 1	TCE
	13	List 1	--
	108	List 1	TCE
	BB	List 1	--
	RR	List 1	--
	SS	List 1	--
	UU	List 1	--
	WW	List 1	--
Magnolia	OO	List 1	TCE
	QQ	List 1	--
	TT	List 1	--
	VV	List 1	TCE
	ZZ	List 1	TCE
St. Peter	200	List 1	TCE
	201	List 1	--
	202	List 1	--
	203	List 1	--
Prairie du Chien-Jordan	Henkel[5]	List 1	List 1

[3]List 1 - Collection and analysis of water quality samples for List 1 parameters using EPA Method 601.

[4]TCE - Collection and analysis of water quality samples for trichlorethene (TCE) using EPA Method 601.

[5]Henkel - Collection of water quality samples dependent upon operation status of former Henkel Corporation well.

TABLE B-1 (Continued)

RECOMMENDED 1991 MONITORING
STATIONS AND SAMPLING FREQUENCIES

	Jan-Feb	Apr-May	Jul-Aug	Oct-Nov
Influent (Pump-Out Wells 108, 109, 110), Station 20100	TCE[4]	List 2,[6] List 3[7]	TCE	List 2
Effluent (Pump-Out Wells 108, 109, 110), Station 20100	TCE	List 2	TCE	List 2
Discharge (Pump-Out Wells 111, 112, 113), Station 20200	TCE	List 2	TCE	List 2

---

[6]List 2 - Collection and analysis of water quality samples for List 2 parameters using EPA Method 601/602.

[7]List 3 - Collection and analysis of water quality samples for List 3 parameters using EPA Method 624 with tentatively identified compounds (TIC).

TABLE B-2

RECOMMENDED 1991 WATER QUALITY
ANALYTICAL PARAMETER LISTS

List 1[1]

Chlorinated Volatile Solvents

1,1-Dichloroethane
1,2-Dichloroethane
1,2-Dichloroethane, cis
1,2-Dichloroethane, trans
1,1,2,2-Tetrachloroethane
Tetrachloroethylene
1,1,1-Trichloroethane
Trichloroethene

List 2[2]

Chlorinated Volatile Solvents

1,1-Dichloroethane
1,2-Dichloroethane
1,2-Dichloroethane, cis
1,2-Dichloroethane, trans
1,1,2,2-Tetrachloroethane
Tetrachloroethylene
1,1,1-Trichloroethane
Trichloroethene

Non-Chlorinated Volatile Solvents

Benzene
Toluene
Xylenes

List 3[3]

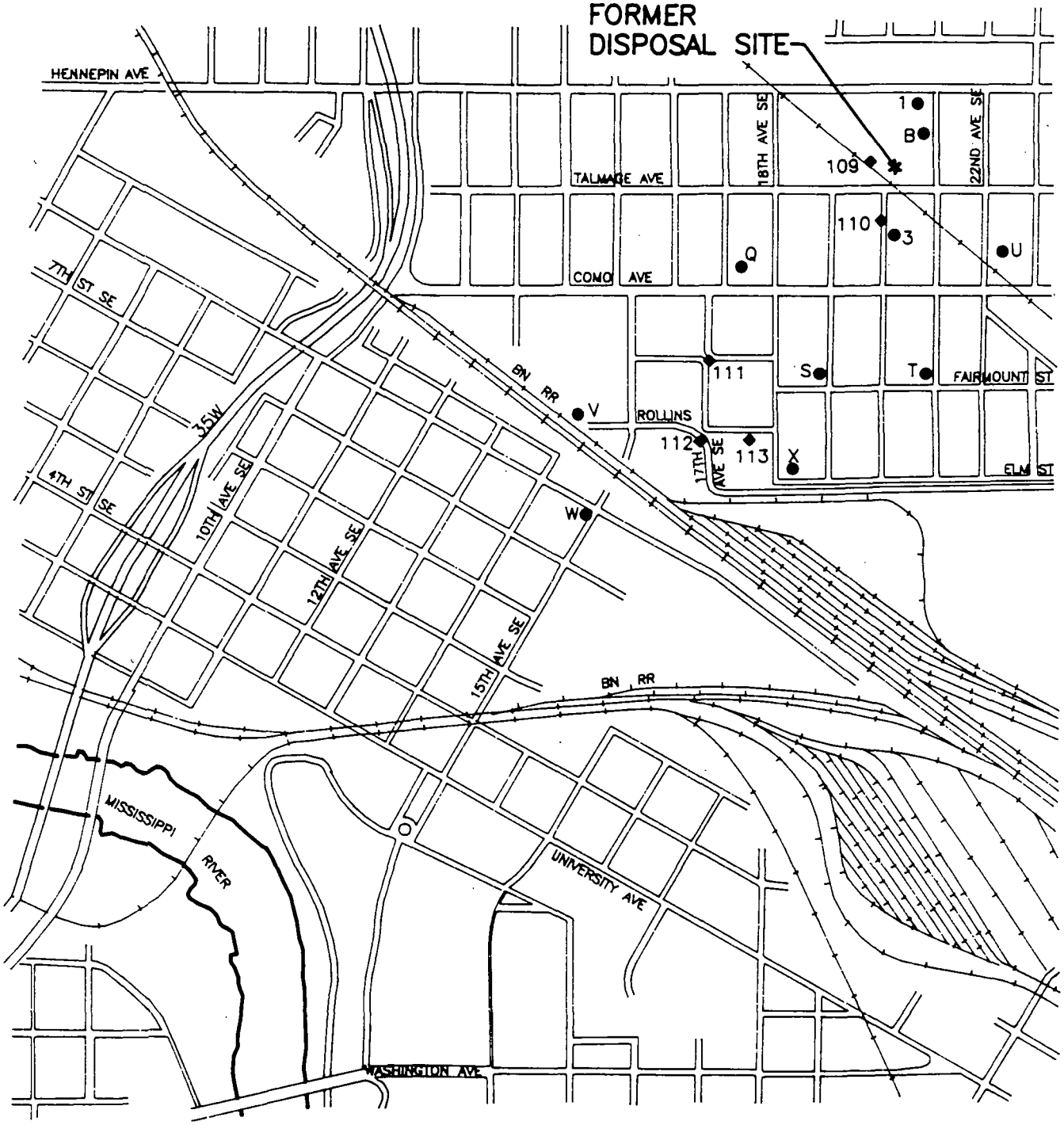
Priority Pollutant Volatile Organics

Benzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon Tetrachloride
Chlorobenzene
Chloroethane
2-Chloroethylvinyl Ether
Chloroform
Chloromethane
Chlorodibromomethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,1-Dichloroethane
Trichloroethene
1,1-Dichloroethane
1,1,2-Trichloroethane
Vinyl Chloride
1,2-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethene, trans
1,2-Dichloropropane
cis-1,3-Dichloropropane
Methylene Chloride
trans-1,3-Dichloropropene
Ethyl Benzene
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Toluene
1,1,1-Trichloroethane

---

[1]List 1 - Analyzed using EPA Method 601.
[2]List 2 - Analyzed using EPA Methods 601/602.
[3]List 3 - Analyzed using EPA Method 624 with tentatively identified compounds (TIC).

Figures



● GLACIAL DRIFT MONITORING WELL

◆ GLACIAL DRIFT PUMP-OUT WELL

0 1000

SCALE IN FEET

Figure B-1

GLACIAL DRIFT AQUIFER
1991 MONITORING LOCATIONS

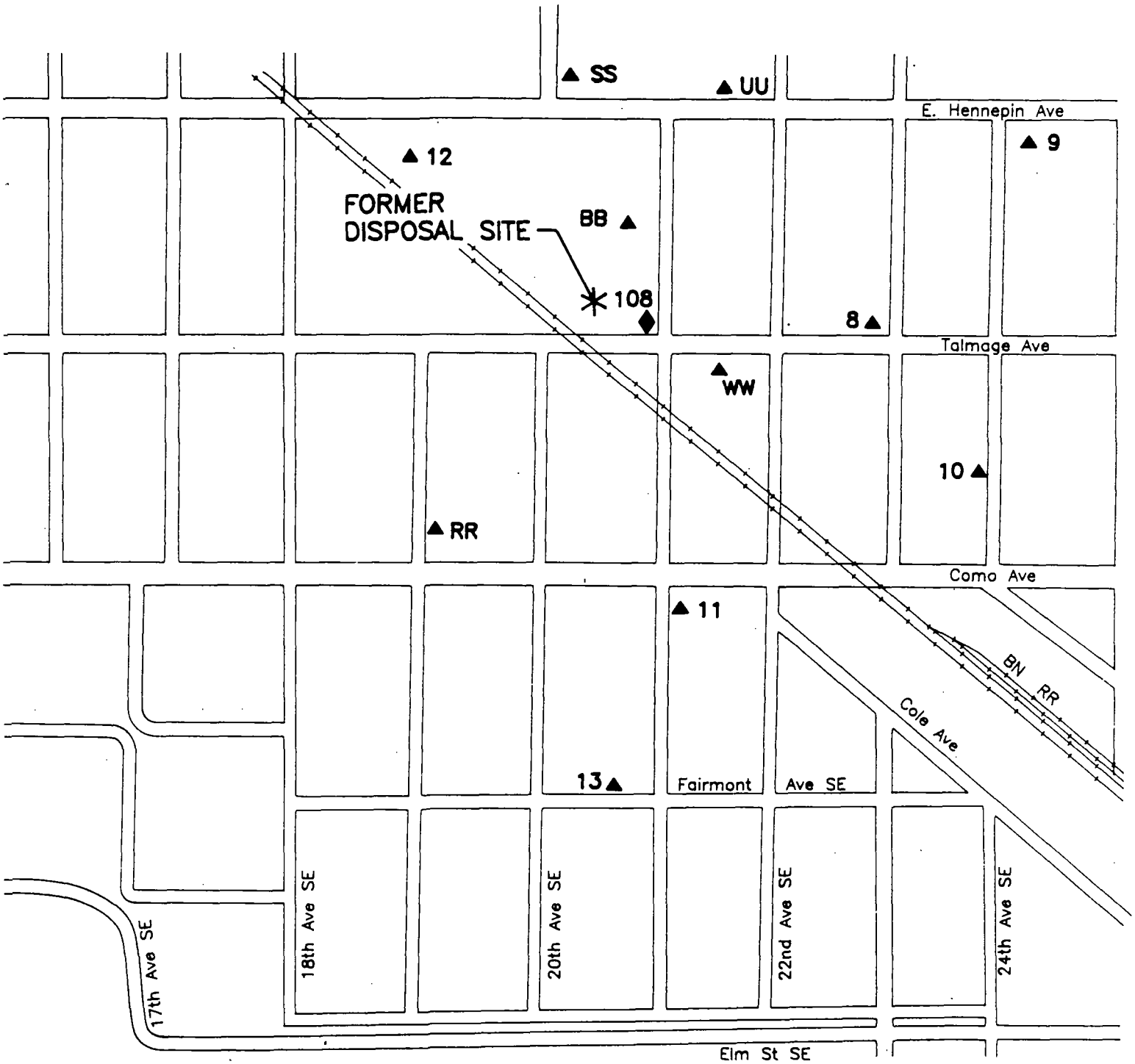


Figure B-2

CARIMONA MEMBER
1991 MONITORING LOCATIONS

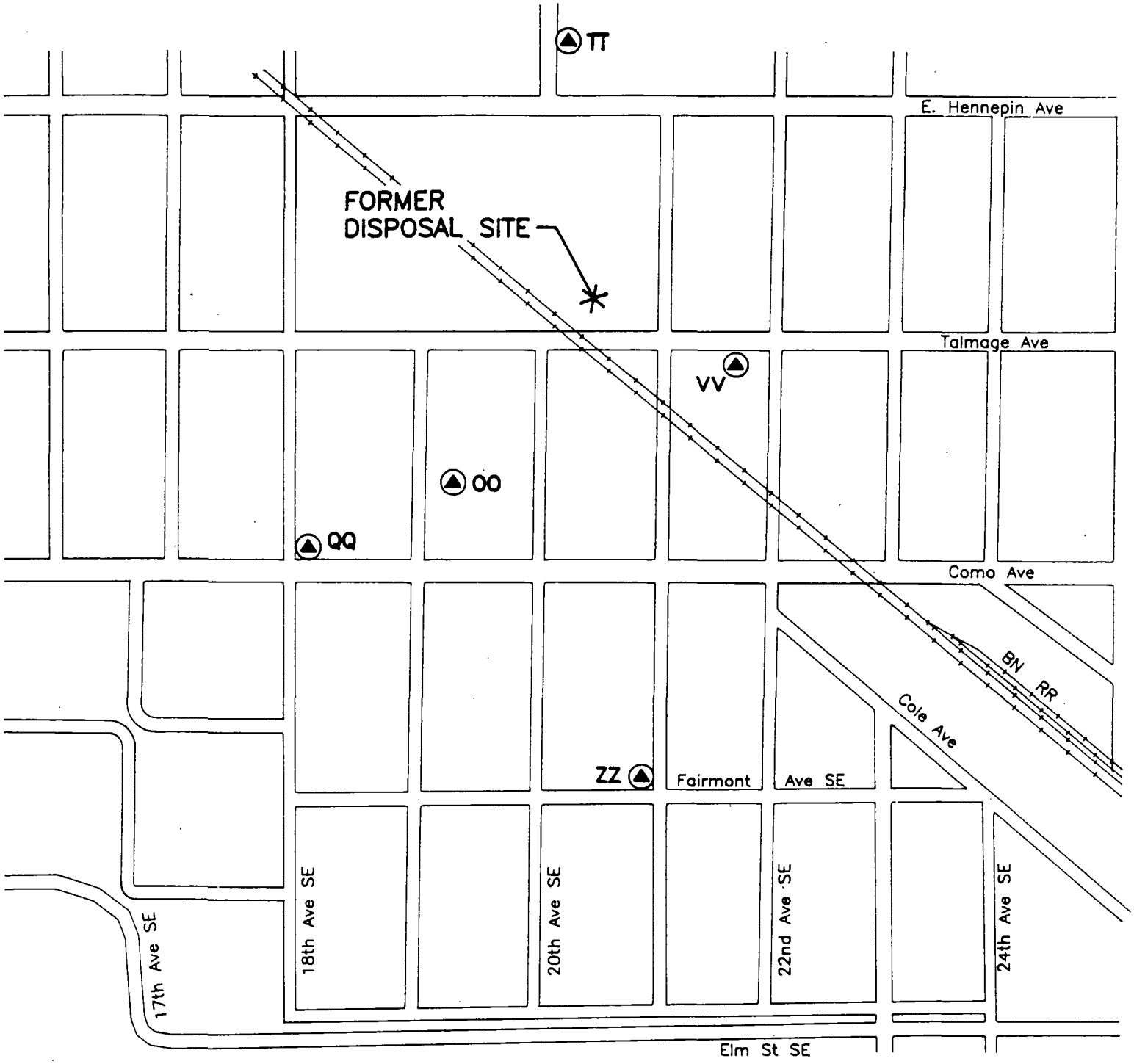
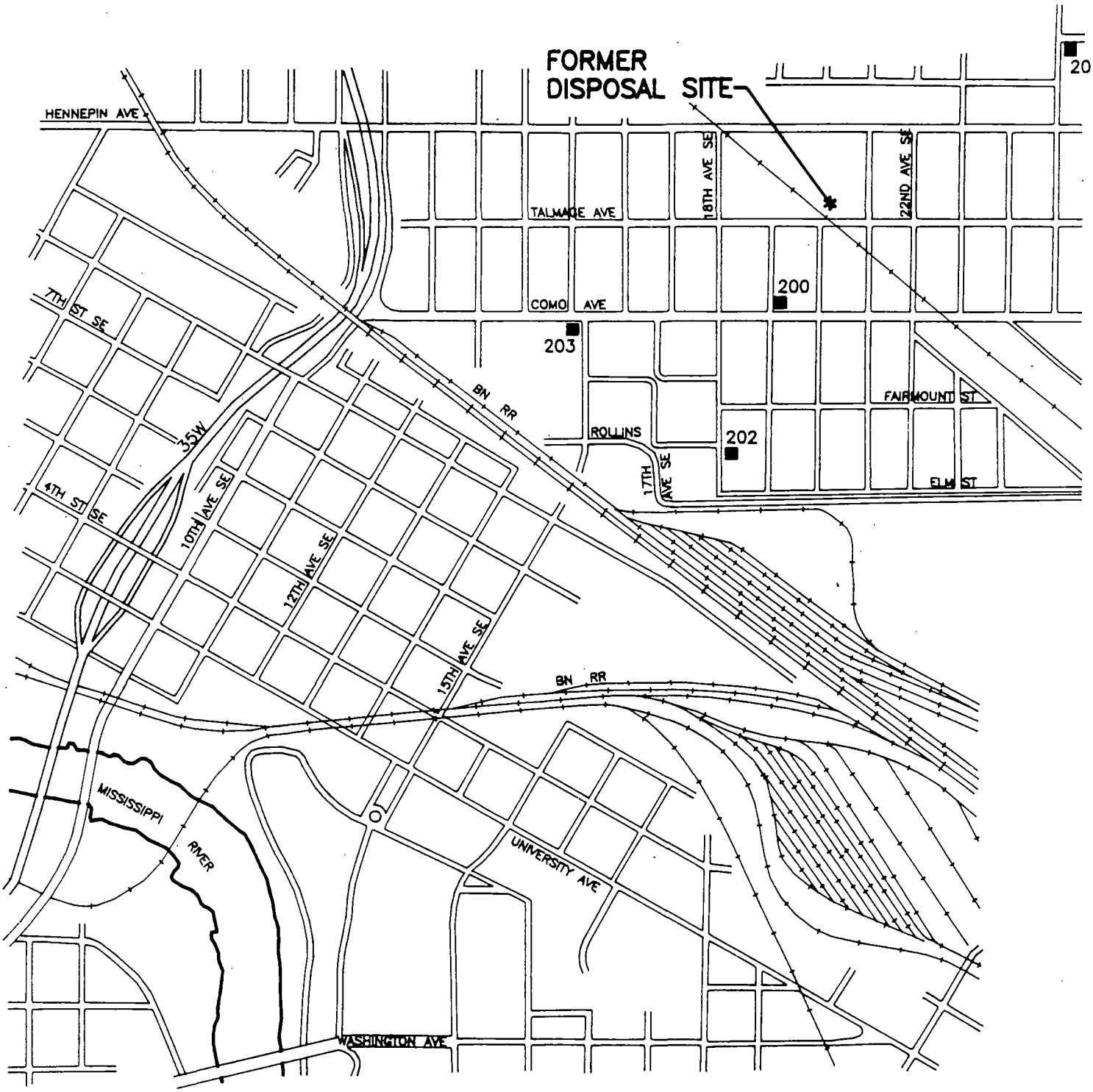


Figure B–3

MAGNOLIA MEMBER
1991 MONITORING LOCATIONS



■ ST. PETER MONITORING WELL

N

0 1000

SCALE IN FEET

Figure B-4

ST. PETER
1991 MONITORING LOCATIONS

Appendix C

Historical Water Elevation and Water Quality Data

APPENDIX C

HISTORICAL WATER ELEVATION AND WATER QUALITY DATA

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TABLE C-1

HISTORICAL WATER ELEVATION DATA
GLACIAL DRIFT WELLS

(elevations in feet/MSL)

DATE	1	3	4	106	107
02/82	843.19	--	--	--	--
02/82	842.37	--	--	--	--
03/82	842.37	--	--	--	--
03/82	842.28	--	--	--	--
03/82	842.29	835.95	833.20	--	--
04/82	842.54	836.07	833.30	--	--
04/82	842.54	836.07	833.35	--	--
11/82	843.70	836.48	833.89	--	--
02/83	842.96	836.16	833.53	--	--
04/83	843.44	836.88	834.11	840.25	840.19
06/83	842.90	837.58	834.88	839.40	839.25
09/83	--	836.95	834.38	838.80	838.68
11/83	--	--	--	838.57	--
01/84	--	--	--	839.40	837.36
01/84	--	--	--	838.48	838.41
03/84	--	837.23	834.20	838.68	838.65
10/85	842.68	836.57	--	838.52	838.42
12/85	842.38	835.19	833.40	837.12	836.96
07/87	842.0	832.75	--	--	--
10/87	842.34	834.30	--	--	--
04/88	841.90	832.89	830.23	835.63	835.54
07/88	841.69	832.45	--	--	--
10/88	841.77	833.00	--	--	--
04/89	841.74	833.30	830.79	--	835.34
07/89	841.75	833.76	--	--	--
10/89	841.72	833.98	--	--	--
05/90	--	833.65	830.43	--	--
07/90	841.90	834.35	--	836.36	836.17
10/90	841.69	834.15	--	--	--

-- Not measured.

2,.012

TABLE C-1 (cont.)

HISTORICAL WATER ELEVATION DATA
GLACIAL DRIFT WELLS

(elevations in feet/MSL)

DATE	B	Q	R	S	T
10/81	843.31	--	--	--	--
02/82	844.45	--	--	--	--
02/82	842.78	--	--	--	--
02/82	842.77	--	--	--	--
03/82	842.84	--	--	--	--
03/82	842.72	--	--	--	--
03/82	842.68	--	--	--	--
03/82	824.89	--	--	--	--
04/82	842.96	--	--	--	--
04/82	843.03	--	--	--	--
04/82	843.03	--	--	--	--
04/82	843.14	--	--	--	--
11/82	843.56	--	--	--	--
12/82	843.59	--	--	--	--
02/83	843.30	--	--	--	--
04/83	844.13	--	--	--	--
06/83	844.37	--	--	--	--
09/83	844.14	--	--	--	--
11/83	844.01	--	--	--	--
01/84	843.93	--	--	--	--
02/84	--	830.49	827.64	829.85	832.38
03/84	844.13	832.08	829.15	831.21	833.89
10/85	843.89	831.58	829.00	832.00	833.96
12/85	843.86	831.22	828.73	830.95	833.37
07/87	--	--	DRY	824.91	831.74
10/87	--	--	--	826.36	832.72
04/88	843.38	826.86	--	824.94	831.80
07/88	--	826.46	DRY	824.63	832.44
10/88	--	826.77	DRY	824.92	833.03
04/89	843.17	827.45	DRY	825.23	832.25
07/89	--	827.95	DRY	825.55	832.41
10/89	--	828.26	DRY	826.45	832.23
05/90	--	827.08	DRY	825.92	832.14
07/90	844.33	828.50	DRY	827.38	832.89
10/90	--	828.28	DRY	827.43	832.62

-- Not measured.

2,.012

TABLE C-1 (cont.)

HISTORICAL WATER ELEVATION DATA
GLACIAL DRIFT WELLS

(elevations in feet/MSL)

DATE	U	V	W	X
02/84	837.07	--	--	--
03/84	838.82	818.16	818.25	829.00
10/85	838.11	818.61	818.49	831.59
12/85	837.30	817.99	817.96	829.02
07/87	--	815.3	814.4	DRY
10/87	--	815.93	816.10	--
04/88	835.58	814.51	814.59	DRY
07/88	--	814.03	814.03	DRY
10/88	--	814.44	814.54	DRY
04/89	835.72	814.19	814.34	DRY
07/89	--	814.77	814.86	822.05
10/89	--	815.16	815.26	DRY
05/90	835.86	814.64	814.38	822.07
07/90	--	816.65	816.75	822.95
10/90	--	816.70	816.80	823.08

-- Not measured.

2.,012

TABLE C-2

HISTORICAL WATER ELEVATION DATA
CARIMONA MEMBER WELLS

(elevations in feet/MSL)

DATE	8	9	10	11	12	13
11/82	828.91	--	--	--	--	--
04/83	836.76	--	--	--	--	--
06/83	835.81	--	--	--	--	--
09/83	838.68	--	--	--	--	--
09/83	835.51	--	--	--	--	--
03/84	830.15	830.15	830.21	830.18	831.43	830.21
10/85	830.58	830.61	830.62	830.65	832.11	830.01
12/85	829.71	830.05	829.86	829.73	831.50	829.25
07/87	827.10	827.3	827.28	827.26	827.83	826.49
10/87	828.79	828.69	828.72	828.79	828.63	828.14
04/88	827.71	827.85	827.86	827.74	828.12	827.05
07/88	824.91	825.12	825.07	824.97	825.40	824.36
10/88	826.83	826.98	826.99	826.86	826.61	826.17
04/89	827.13	827.37	827.37	827.16	827.20	826.63
07/89	825.41	825.64	825.59	825.43	826.18	824.74
10/89	827.32	827.52	827.82	827.37	826.70	826.78
05/90	827.06	827.38	827.26	827.31	827.52	826.65
07/90	827.92	828.18	828.10	827.84	826.73	827.20
10/90	828.38	828.59	828.58	828.41	828.23	827.78

-- Not measured.

2,.011

TABLE C-2 (cont.)

HISTORICAL WATER ELEVATION DATA
CARIMONA MEMBER WELLS

(elevations in feet/MSL)

DATE	108 (1)	BB	RR	SS	UU	WW
10/81	--	828.09	--	--	--	--
11/81	--	827.85	--	--	--	--
02/82	--	829.87	--	--	--	--
02/82	--	827.85	--	--	--	--
02/82	--	827.77	--	--	--	--
03/82	--	827.85	--	--	--	--
03/82	--	828.61	--	--	--	--
03/82	--	827.81	827.73	--	--	--
03/82	--	827.76	827.73	--	--	--
04/82	--	827.89	827.76	--	--	--
04/82	--	827.82	--	--	--	--
04/82	--	827.82	827.57	--	--	--
04/82	--	828.08	828.17	--	--	--
11/82	--	829.07	829.12	835.43	828.85	828.91
12/82	--	829.18	829.22	835.67	831.10	829.08
02/83	--	828.89	828.98	834.07	828.98	828.76
02/83	--	--	--	834.25	--	--
04/83	--	829.69	829.72	834.13	829.54	829.48
06/83	--	829.96	829.97	834.29	829.86	829.77
09/83	--	829.66	829.53	823.15	829.55	829.45
11/83	830.12	830.15	830.08	833.90	830.24	829.95
01/84	--	829.84	--	833.55	829.80	829.69
01/84	830.65	830.12	828.99	833.50	830.02	829.94
03/84	830.92	830.25	830.16	832.34	830.18	830.08
10/85	830.77	830.26	830.19	831.76	830.63	830.60
12/85	812.90	829.76	829.90	830.59	829.88	829.79
07/87	805.9	--	827.11	826.18	--	--
10/87	806.06	--	828.82	827.27	--	--
04/88	804.57	827.81	827.85	826.22	827.72	827.71
07/88	804.45	--	825.11	824.05	--	--
10/88	804.49	--	826.95	825.37	--	--
04/89	807.81	827.34	827.35	825.54	827.31	827.31
07/89	804.51	--	825.65	823.62	--	--
10/89	827.49	--	827.57	825.12	--	--
05/90	--	--	827.41	824.77	827.28	827.27
07/90	804.54	828.01	827.98	827.05	--	--
10/90	804.64	--	828.48	826.74	--	--

(1) Carimona pump-out well.
-- Not measured.

2,.011

TABLE C-3

HISTORICAL WATER ELEVATION DATA
MAGNOLIA MEMBER WELLS

(elevations in feet/MSL)

	OO	QQ	TT	VV	ZZ
DATE					
03/82	823.60	823.25	--	--	--
03/82	823.60	823.34	--	--	--
03/82	823.48	823.29	--	--	--
04/82	823.64	823.37	--	--	--
04/82	823.72	823.42	--	--	--
04/82	823.99	823.75	--	--	--
11/82	824.96	824.61	822.41	825.57	--
12/82	824.79	824.41	822.59	825.76	--
02/83	825.51	823.57	822.34	825.50	--
02/83	--	--	822.62	--	--
04/83	825.29	823.00	822.90	826.32	--
06/83	825.80	825.61	823.60	826.43	--
09/83	824.71	825.20	829.55	826.18	--
11/83	825.69	825.44	823.44	826.52	--
01/84	825.46	--	823.26	826.32	--
03/84	825.78	825.61	823.54	826.64	830.2
02/85	--	--	822.62	--	--
10/85	825.76	825.46	823.26	826.99	830.67
12/85	825.57	825.39	822.74	826.24	830.65
02/86	824.74	824.49	822.10	825.60	830.05
04/86	824.75	824.52	822.10	825.60	829.65
06/86	824.89	824.68	822.31	825.66	828.31
08/86	824.86	824.71	822.32	825.65	829.44
10/86	825.49	825.24	822.90	826.33	830.45
04/87	823.87	823.66	821.46	824.83	829.25
07/87	822.85	822.53	820.42	823.42	827.93
10/87	824.24	823.96	821.77	824.99	829.98
04/88	823.31	823.03	820.91	824.14	828.44
07/88	821.14	820.82	818.88	821.73	825.73
10/88	822.46	822.11	820.13	823.34	827.57
04/89	822.82	822.47	820.46	823.75	828.72
07/89	821.66	821.32	819.38	822.36	826.05
10/89	823.07	822.70	820.69	823.98	828.20
05/90	822.79	822.51	820.42	823.65	828.04
07/90	823.67	823.36	821.35	824.57	828.65
10/90	823.99	823.73	821.56	824.88	829.16

-- Not measured.

2,.010

TABLE C-4

HISTORICAL WATER ELEVATION DATA
ST. PETER SANDSTONE WELLS

(elevations in feet/MSL)

DATE	200	201	202	203
10/85	--	779.64	751.98	752.05
12/85	758.68	780.24	752.60	757.58
07/87	760.63	777.82	753.86	753.43
10/87	760.47	779.35	753.28	753.42
04/88	761.89	780.40	753.36	753.37
07/88	758.57	773.59	752.28	752.10
10/88	760.78	778.42	752.53	752.43
04/89	762.22	779.61	753.67	753.57
07/89	758.96	775.98	752.77	752.37
10/89	760.36	777.25	752.70	752.43
05/90	761.79	778.59	753.72	753.29
07/90	759.54	776.15	753.16	752.61
10/90	759.90	776.67	752.44	751.93

-- Not measured.

2,.013

TABLE C-5

HISTORICAL WATER ELEVATION DATA
GLACIAL DRIFT PUMP-OUT WELLS

(elevations in feet/MSL)

DATE	109 (1)	110 (1)	111 (2)	112 (2)	113 (2)
10/85	837.21	835.62	829.25	829.10	829.20
12/85	828.19	829.11	828.83	828.59	828.77
07/87	831.26	829.63	816.75	811.67	814.24
10/87	829.94	828.98	813.70	814.64	815.68
04/88	828.90	823.37	808.70	811.81	813.00
07/88	831.00	822.35	815.35	807.91	812.63
10/88	829.99	829.52	815.62	811.68	813.15
04/89	831.41	828.90	818.43	811.80	817.22
05/90	--	830.71	818.20	807.67	817.96
07/90	827.27	831.02	819.07	811.77	818.80
10/90	829.63	831.51	819.23	811.03	819.12

-- Not measured due to restricted site access.
(1) Site glacial drift pump-out wells.
(2) Down-gradient glacial drift pump-out wells.

2,.012

TABLE C-6

HISTORICAL WATER QUALITY DATA
GLACIAL DRIFT WELLS
TRICHLOROETHENE

(concentrations in ug/L)

DATE	B	Q	R	S	T
04/82	6.0	--	--	--	--
12/82	1100	--	--	--	--
12/83	780	--	--	--	--
02/84	--	<1.3	670	770	<1.3
10/85	1200	20	1100	740	<0.3
12/85	1100	14	820	750	<0.8
02/86	1300	11	31	650	<0.5
04/86	1000	13	DRY	1100	<0.2
06/86	1100	4.7	160	930	<0.2
08/86	1000	5.6	DRY	880	<0.2
10/86	--	3.2	--	620	<0.2
11/86	830	--	--	--	--
04/87	800	2.6	DRY	650	<0.2
07/87	--	--	DRY	740	--
10/87	--	--	--	1000	--
04/88	330	0.86	DRY	460	<0.50
07/88	--	--	DRY	160	--
10/88	--	--	DRY	110	--
04/89	250	1.1	DRY	860	<0.5
07/89	--	--	DRY	620	--
10/89	--	--	DRY	630	--
05/90	--	0.7	DRY	710	<0.5
07/90	330	--	DRY	200	--
10/90	--	--	DRY	770	--

-- Not analyzed.

2,.014

TABLE C-6 (cont.)

HISTORICAL WATER QUALITY DATA
GLACIAL DRIFT WELLS
TRICHLOROETHENE

(concentrations in ug/L)

DATE	1	3	4
04/82	6.0	780	4.5
12/83	27	800	380
10/85	1.4	1100	--
11/85	--	--	440
12/85	1.5	770	440
02/86	1.4 s	680	200
04/86	3.1	1200	210
06/86	8.1	1300	180
08/86	9.3	890	280
10/86	0.9	720	200
04/87	2.7	740	120
07/87	0.4	770	--
10/87	0.8	960	--
04/88	<0.50	440	55
07/88	0.5	140	--
10/88	<0.50	98	--
04/89	0.8	320	55
07/89	0.6 s	340	--
10/89	0.5	530	--
05/90	--	520	77
07/90	0.8	770	--
10/90	<0.5	310	--

-- Not analyzed.
s Potential false positive value based on data validation procedures.

2,.016

TABLE C-6 (cont.)

HISTORICAL WATER QUALITY DATA
GLACIAL DRIFT WELLS
TRICHLOROETHENE

(concentrations in ug/L)

DATE	U	V	W	X
02/84	<1.3	--	--	--
03/84	--	78	7.5	2.2
10/85	2.6	220	8.1	2.1
12/85	3.9	140	32	5.0
02/86	2.9	180	14	0.9 s
04/86	3.2	170	18	0.9
06/86	1.6	97	10	0.9
08/86	16	130	18	0.7
10/86	1.4	92	6.2	0.5
04/87	2.7	160	24	--
07/87	--	180	42	--
10/87	--	140	56	--
04/88	--	160	43	DRY
07/88	--	33	8.1	--
10/88	--	37	26	--
04/89	--	130	57	DRY
07/89	--	120	22	--
10/89	--	120	25	--
05/90	--	110	31	DRY
07/90	--	120	<0.5	--
10/90	--	110	11	--

-- Not analyzed.
s Potential false positive value based on data validation procedures.

2,.015

TABLE C-7

HISTORICAL WATER QUALITY DATA
CARIMONA MEMBER WELLS
TRICHLOROETHENE

(concentrations in ug/L)

DATE	BB	RR	SS	UU	WW
05/82	--	46	--	--	--
06/82	1600	--	--	--	--
12/82	1600	43	<0.05	78	2100
12/83	1400	33	<1.5	81	1700
10/85	1900	110	0.4 s	150	2300
12/85	1100	95	1.2	79	1200
02/86	1300	88	<0.5	71	740
04/86	2200	170	0.4	81	540
06/86	2100	85	0.3	37	290
08/86	1800	100	0.3	45	220
10/86	--	--	<0.2	36	--
11/86	1300	100	--	--	290
04/87	1100	110	1.2	12	290
04/88	530	220	<0.50	23	320
04/89	340	180	1.3	38	530
05/90	--	60	4.1	35	450
07/90	530	--	--	--	--

-- Not analyzed.
s Potential false positive value based on data validation procedures.

2,.017

TABLE C-7 (cont.)

HISTORICAL WATER QUALITY DATA
CARIMONA MEMBER WELLS
TRICHLOROETHENE

(concentrations in ug/L)

DATE	8	9	10	11	12	13	108
04/83	820	--	--	--	--	--	--
11/83	--	--	--	--	--	--	1100
12/83	96	<0.05	2.6	120	<1.5	--	--
01/84	--	--	--	--	--	--	1100
03/84	--	--	--	--	--	25	--
10/85	2300	17	1500	2.7	--	1.9	--
11/85	--	--	--	--	<0.2	--	1500
12/85	650	10	1100	520	<0.8	21	820
02/86	240	6.7	420	250	<0.5	9.7	700
04/86	180	8.0	290	120	0.5	120	750
06/86	140	6.1	280	58	<0.2	130	640
08/86	160	6.7	270	67	0.2	14	580
10/86	110	5.4	220	40	<0.2	0.5	540
04/87	86	5.1	120	160	<0.2	140	450
07/87	--	0.6	150	25	<0.2	--	580
10/87	--	9.5	170	180	<0.5	--	560
04/88	160	4.5	56	79	<0.5	<0.50	200
07/88	--	1.7	34	0.3	<0.5	--	96
10/88	--	10	58	0.7	1.0 s	--	87
04/89	380	9.8	160	110	<0.5	110	530
07/89	--	9.9	99	3.6	2.1	--	340
10/89	--	12	140	5.0	<0.5	--	--
12/89	--	--	--	--	--	--	490
05/90	100	8.5	150	<0.5	0.7	110	570
07/90	--	43	180	16	<0.5	--	400
10/90	--	9.4	130	240	<0.5	--	420

s Potential false positive value based on data validation procedures.
-- Not analyzed.

2,.005

TABLE C-8

HISTORICAL WATER QUALITY DATA
MAGNOLIA MEMBER WELLS
TRICHLOROETHENE

(concentrations in ug/L)

DATE	OO	QQ	TT	VV	ZZ
05/82	15	--	--	--	--
06/82	--	13	--	--	--
12/82	56	13	8.9	--	--
03/84	--	--	--	--	14
10/85	49	2.9	26	140	85
12/85	31	7.3	19	93	28
02/86	36	5.2	27	92	200
04/86	120	6.0	33	280	440
06/86	27	1.0	20	83	91
08/86	19	0.6	40	99	39
10/86	32	6.4	23	77	190
04/87	130	2.5	34	63	230
04/88	160	<0.50	16	63	130
07/88	20	--	--	9.4	--
10/88	34	--	--	25	43
04/89	90	3.7	30	59	180
07/89	70	--	--	87	34
10/89	67	--	--	150	33
05/90	58	3.4	26	33	120
07/90	62	--	--	27	61
10/90	30	--	--	46	36

-- Not analyzed.

TABLE C-9

HISTORICAL WATER QUALITY DATA
ST. PETER SANDSTONE WELLS
TRICHLOROETHENE

(concentrations in ug/L)

DATE	200	201	202	203
10/85	--	0.5 s	--	--
11/85	120	--	2.6	0.5 s
12/85	100	2.9	2.0	1.2
02/86	72	<0.5	1.9	2.5
04/86	130	<0.2	0.2	0.6
06/86	110	<0.2	0.2 s	0.5
08/86	110	<0.2	2.7	0.5
10/86	78	<0.2	<0.2	0.5
04/87	100	0.1	<0.2	0.7
07/87	120	--	--	--
10/87	160	--	--	--
04/88	89	<0.50	<0.50	<0.50
07/88	33	--	--	--
10/88	56	--	--	--
04/89	150	<0.5	<0.5	2.1
07/89	130	--	--	--
10/89	120	--	--	--
05/90	110	<0.5	0.8	2.8
07/90	11	--	--	--
10/90	130	--	--	--

s Potential false positive value based on data validation procedures.
-- Not analyzed.

2,.008

TABLE C-10

HISTORICAL WATER QUALITY DATA
PRAIRIE DU CHIEN/JORDAN WELL
TRICHLOROETHENE

(concentrations in ug/L)

DATE	HENKEL
10/85	71
12/85	44
02/86	48
04/86	OFF
06/86	OFF
08/86	54
11/86	6.9
04/87	7.1
07/87	20
10/87	6.7
04/88	13
07/88	1.5
10/88	8.0
04/89	12
07/89	10
10/89	11
2,.006	

TABLE C-11

HISTORICAL WATER QUALITY DATA
SITE PUMP-OUT AND TREATMENT SYSTEM
DOWNGRADIENT PUMP-OUT SYSTEM
TRICHLOROETHENE

(concentrations in ug/L)

DATE	(1) DISCHARGE	(2) INFLUENT	(3) EFFLUENT
11/85	160	1200	13
12/85	140	870	12
01/86	--	1100	17
02/86	290	760	8.4
03/86	--	1700	14
04/86	400	860	11
06/86	250	--	--
08/86	350	870	6.7
10/86	190	610	1.0
03/87	320	730	6.8
04/87	170	530	8.3
07/87	310	660	2.8
10/87	230	720	<0.5
11/87	--	490	2.6
01/88	300	470	4.4
04/88	210	370	5.3
07/88	70	160	1.2
10/88	64	--	--
11/88	--	84	3.7
01/89	210	390	9.8
04/89	200	440	13
07/89	170	380	20
10/89	110	--	--
12/89	--	140	190
01/90	140	380	96
05/90	220	370	1.2
07/90	180	310	0.9
10/90	100	360	2.9

(1) Flow rate weighted composite sample (pump-out wells 111, 112, and 113)
(2) Flow rate weighted composite sample (pump-out wells 108, 109, and 110)
(3) Effluent from treatment system.
-- Not analyzed.